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U. S. DEPARTMENT OF AGRICULTURE.
DIVISION OF ENTOMOLOGY.
BULLETIN NO. 7.

THE PEDICULI AND MALLOPHAGA

AFFECTING

MAN AND THE LOWER ANIMALS.

BY

PROF. HERBERT OSBORN.

(PUBLISHED BY THE AUTHORITY OF THE SECRETARY OF AGRICULTURE.)

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LETTER OF SUBMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF ENTOMOLOGY,
Washington, D. C., November 28, 1890.

SIR: I have the honor to submit for publication Bulletin No. 7, on the Pediculi and Mallophaga affecting man and the lower animals, by Prof. Herbert Osborn, the Iowa agent of the Division.

In explanation of the numbering of this bulletin it is necessary to state that Bulletin No. 7 was originally intended to cover a monograph by myself of the genus Acronycta, a genus of Noctuidæ popularly known as "daggers," and the larvæ of which are, many of them, quite destructive to forest trees. The manuscript and figures of this monograph have been, for the most part, prepared for several years, and I have hoped each year to be able to put them in the printer's hands; but more urgent divisional work has caused continued postponement, and in order to avoid the hiatus which the delay has caused in the series of special bulletins I have deemed it best to call the present bulletin No. 7.

Respectfully,

C. V. RILEY,
Entomologist.

Hon. J. M. RUSK,
Secretary of Agriculture.

INTRODUCTORY NOTE.

The matter included in the following pages was written to form part of a report upon the insects affecting vertebrate animals, which was begun as a conjoint work by Dr. Riley and myself.

Various circumstances having delayed the completion of the report, Dr. Riley has requested that this portion be put in print under my signature.

The publication of this portion singly makes me responsible for the matter presented, but I wish to acknowledge the many favors received from Dr. Riley which have facilitated the work and made it certainly better than it could otherwise have been.

The figures have in most cases been sketched by the author and finished under Dr. Riley's supervision by Miss Lillie Sullivan. A certain number have been copied from other works, and these will be found duly credited in their place.

HERBERT OSBORN.

WASHINGTON, D. C.,
July 8, 1890.

ORDER HEMIPTERA.

SUBORDER PARASITA.

This group includes the suctorial lice, confined to mammals; they are strictly parasitic insects, being confined to their hosts constantly, and deriving all their nourishment from them. They are wingless, and the mouth parts consist of a tubular suctorial organ.

This suborder contains but two families, the first of which, the *Polyctenidæ*, contains, so far as known, but two species, both of which are confined to bats, one in Jamaica and the other in China. These do not properly fall within the province of this paper, and it will not be necessary to give them further consideration.

FAMILY PEDICULIDÆ—THE SUCTORIAL LICE.

This family includes nearly all the species of the suborder and all that come within the limits of this paper.

We need only add to the character above given the short rostrum without joint and the tarsi adapted to clasping and holding to hairs.

The eggs, "nits," are attached to hairs by a glue-like substance, and the young lice when hatched resemble the adults except in size. As the entire life of the parasite is passed upon the same animal or on another animal of the same kind, its range of habit is easily stated.

But very few of the species are ever found upon any other species of animal than that which they normally infest, and if so always upon very nearly related species. Whether this is due to differences in the thickness of the skin, of temperature, of the size of the hair to which they must adhere and to which their feet are adapted, or to some subtle difference in the odor or taste peculiar to their particular host which leads them to discard all others, we are unable to say.

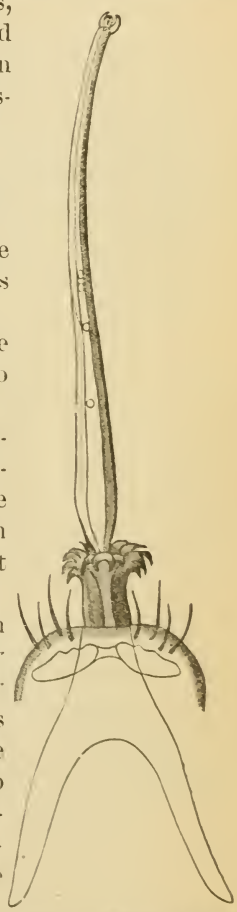

FIG. 1.—Mouth parts of *Pediculus vestimenti*, showing rostrum and extensile tube—greatly enlarged.

The mouth parts are necessarily capable of great extension in order to reach the blood of their hosts. Uhler says (Standard Nat. Hist., II, p. 209): "A fleshy unjointed rostrum, capable of great extension by being rolled in-

side out, this action serving to bring forward a chaplet of barbs which imbed themselves in the skin to give a firm hold for the penetrating bristles, arranged as chitinous strips in a long, slender, flexible tube, terminated by four very minute lobes, which probe to the capillary vessels of a sweat pore (see Fig. 1). The blood being once reached a current is maintained by the pulsations of the pumping ventricle and the peristaltic movements of the stomach."

The species infesting man are so nearly related to the others that we can not well pass them by without notice.

THE CRAB LOUSE.

(*Phthirius inguinalis* Leach.)

If we may depend upon ancient writers this species has been a long companion of man. According to Denny it is recorded by Herodotus, and according to Piaget was referred to in the writings of Aristotle. Some of the ancient accounts treat of it as occurring in the most prodigious numbers and causing most serious ailments to the infested parties. The disease produced gained the name of *Phthiriasis*, though doubtless this term has been applied also to the attacks of the other species of parasites infesting man.

Its attacks are said to be more severe than those of the other forms of lice, though it is quite probable that in the worst cases reported the different species have been present, since the conditions favoring the increase of one will favor also the others. The reports, especially of the earlier writers, have many of them doubtless been subject to great exaggeration, for while the normal rate of increase will account for the sudden appearance and rapid multiplication of the lice under certain conditions, it is not equal to the marvelous stories which are to be met with even in some works that lay claim to accuracy.

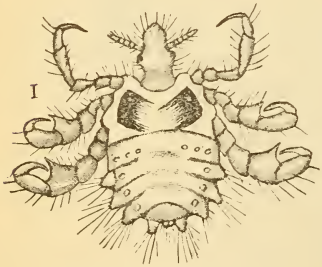

FIG. 2. *Phthirius inguinalis* (After Denny from Murray).

The crab louse infests particularly the pubic regions, but occurs also among the stiff hairs under the arms, in the beard, and it is said also among the hairs of the eyebrows. It does not live in the fine hair of the head.

It is very distinct from the other species, the body being nearly as wide as long, while the strong legs spreading out laterally very greatly increase its apparent width and gives it the form of a crab in miniature, thus winning for it the name of crab louse. It is of a whitish color, with a dusky patch on each shoulder, and with the legs slightly tinged with reddish, the claws having this color more pronounced. It is nearly one-tenth of an inch in length.

The remedies adopted for the head louse are applicable to this species, though it is said they are less effectual and must be persisted in more vigorously. Red precipitate is probably most frequently used.

THE HEAD LOUSE.

(*Pediculus capitis* De Geer.)

This louse has been recognized under one name or another as far back as we have history. While very generally confused with the following species it is probably the one most commonly known, though perhaps not the one which has caused the greatest amount of annoyance or that has occurred in the greatest numbers. The two species were not clearly defined till comparatively recent times.

Elaborate writings upon the louse were given by Swammerdam, Leeuwenhoek (1693), and descriptions of it by Redi, DeGeer, Linné, Geoffroy, Burmeister, Leach, and others, besides innumerable brief mentions and a goodly number of elaborate memoirs upon its embryology, etc. In later days, while a most annoying pest, it does not appear to have caused such serious results as the body louse or the crab louse.

FIG. 3.—*Pediculus capitis* (after Packard).

It is confined to the fine hair of the head, rarely occurring on other parts of the body.

The eggs (nits) are white and glued to the hair at some distance from the head, and are most abundant, we have observed, back of the ears. When numerous they form quite conspicuous objects. The young upon hatching from these resemble the adults, except in size and in being less distinctly marked. The proportions of the body are also somewhat different, the abdomen being smaller than after it has become enlarged by a steady diet upon human blood. The full grown lice are whitish, with faint dark markings at the sides of the thorax and abdomen. The last segment of the abdomen in the female is bilobed.

Murray has shown that the different races of man harbor different varieties of this species of louse, the difference in the varieties being particularly in color and in the form of the claws. In color they differ from the nearly white infesting Europeans to the black infesting the African.

The claws differ somewhat in proportions and Murray thinks these differences constant, but they can at most be considered only as varietal differences.

Remedies are white precipitate, sulphur ointment, and especially cleanliness.

THE BODY LOUSE.

(*Pediculus vestimenti* Leach.)

As with the preceding species the history of this parasite is lost in antiquity, and most of the early accounts failed to indicate any differ-

ence in the two forms. In the works of DeGeer, Leach, Denny, and others they are distinguished and well characterized.

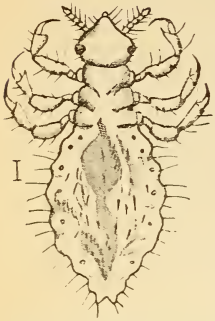

FIG. 4. *Pediculus vestimenti* (after Denny).

This form is most common where opportunities for good sanitation are wanting, as in armies, prisons, and all places where attention to bodily cleanliness from choice or necessity is neglected.

It is not known to infest other animals, though we have seen specimens that were said to have been taken from cattle.

Until fully grown there is not much difference to be noted in the appearance of this and the preceding species, though the markings at the sides are less distinct. In the adult forms, however, the dorsal surface is marked with dark transverse bands.

The insect secretes itself in the folds of the clothing, only penetrating the skin when in want of food. The long, slender sucking tube, by means of which it reaches the small blood vessels near the surface, is shown fully extended in Fig. 1.

The eggs are deposited in folds of the clothing, and, according to the estimates of Leeuwenhoek, a single adult female may have a progeny of 5,000 in 8 weeks, and he adds that in the heat of summer this estimate might be very greatly exceeded. This will readily account for all the authentic accounts of sudden and numerous appearances of this pest.

A ready means of combating this pest is to thoroughly bake the clothing infested with it, or, to be fully as effectual with less heat, this might be accompanied by fumigation with sulphur or tobacco smoke. A repetition of this process two or three times at intervals of a few days, along with strict personal cleanliness, should overcome the most serious attack.

Alt describes, under the name of *Pediculus tabescantium*, the louse, which he considered as the cause of phthiriasis, but later authorities consider this as simply the *vestimenti* present in aggravated numbers. Properly speaking, this affection should be termed *Pediculosis*, and the term phthiriasis reserved for the attacks of *Phthirius inguinalis*.

LOUSE OF THE APE.

(*Pediculus consobrinus* Piaget.)

Closely related to the human lice is a species described by Piaget occurring upon the Ateles ape (*Ateles pentadactylus*). It resembles especially the *Pediculus capitis*, but presents some differences in form of head and structure of abdominal appendages which have led this author to establish the separate species. It appears to differ less, in general appearance, from typical *capitis* than the varieties of *capitis* occurring on different races differ among themselves.

Though there is considerable difference in the drawings, this is probably the same species as figured by Murray (Economic Entomology, p. 389) under the name of *Pediculus quadrumanus* and said to be taken from the Ateles ape.

LICE INFESTING THE MONKEY.

(*Pedicinus* sp.)

Three species of lice are found upon monkeys, all being generically distinct from those infesting other animals. They form the genus *Pedicinus*, the most essential character of which is the presence of but three joints in the antennæ.

The species are the *Pedicinus eurygaster* Gervais, which occurs upon the Macaques, *Macacus nemestrinus*, *cynomolgus*, and *radiatus*, according to Piaget, and *Macacus sinicus*, according to Giebel; *Pedicinus longiceps* Piaget, occurring according to its author upon the *Macacus cynomolgus* and the *Semnopithecus pruinosus;* the *Pedicinus breviceps* Piaget, infesting the *Cercopithecus monas.*

Aside from these species of *Pedicinus*, Gervais describes a species of *Hæmatopinus*, *H. obtusus*, from the *Semnopithecus maurus.*

The abundance of these vermin upon monkeys can be attested by all visitors of zoölogical gardens or menageries, and the ready means adopted by the hosts for their subjugation are equally familiar—a method of destruction which, by the way, is said to be adopted by many tribes of inferior races belonging to the human species.

THE SUCKING DOG-LOUSE.

(*Hæmatopinus piliferus* Burmeister.)

Although the dog has been the closest companion of man among the domestic animals from very early times, and consequently this parasite in all probability well known to keepers of dogs, it was not technically described until about the year 1838.

It does not appear to have been a very numerous or injurious parasite, apparently much less so than the *Trichodectes latus* infesting the same animal, and less annoying than either ticks or fleas. Denny says (Monog. Anop. Brit., p. 29), "I have found it upon dogs two or three times, but it is by no means of common occurrence." We have examined many dogs in quest of it, but only a single specimen so far has been our reward. Denny says (loc. cit.), "I also received specimens from the ferret." It can hardly be inferred, however, that this animal is consequently a normal host for the species, as such an instance might occur entirely from accident, the louse having been transferred from some dog to a ferret associated with it.

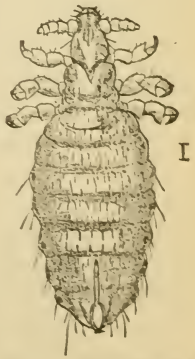

FIG. 5. — *Hæmatopinus piliferus.* (Original.)

This species is somewhat smaller than the lice infesting most of the larger mammals, the full-grown individuals being nearly one-tenth of an inch long. It is described generally as of a light-red or ashy flesh color, but evidently varies as the other species, according to condition of the body as well as age of specimens. In preserved specimens these colors become lighter, assuming a yellowish hue, the abdomen, except where darkened by the intestine and its contents, appearing a shade lighter than the front part of the body. The abdomen is thickly covered with fine hairs and minute warty eminences, these latter when magnified about 300 diameters appearing like the scales of a lizard or fish.

Specimens from different breeds of dogs do not appear to have been noticed as different, though a form described as *H. bicolor* by Lucas may perhaps be found to present race characteristics.

THE LOUSE OF THE CAMEL.

(*Hæmatopinus cameli* Redi.)

We follow Giebel and Piaget in admitting this species, though it does not appear to have been observed by any modern naturalist.

Piaget says (Les Pedic., p. 644): "La figure que donne Redi, le seul qui ait observé cette espèce, se rapproche beaucoup de celle de l'*urius*."

LICE INFESTING THE GIRAFFE, DEER, AND ANTELOPE.

(*Hæmatopinus* sp.)

Closely related to the lice infesting the other hoofed quadrupeds are the lice infesting respectively the giraffe, deer, and antelope. The species infesting the giraffe (*Camelopardalis giraffa*) was described by Giebel under the name *Hæmatopinus brevicornis;* that infesting the deer was first mentioned by Redi and described and named by Nitzsch as *Hæmatopinus crassicornis;* it is recorded from the red deer (*Cervus elaphus*). The *Hæmatopinus tibialis* Piaget, from *Antilopa maori*, is, according to its author, represented by varieties on the *Antilopa* sp. and the *Antilopa subcutturosa*, and he considers it possible that the *H. cervicaprœ* Lucas, from *Antilopa cervicapra*, is also a variety of this same species.

THE SUCKING LOUSE OF THE GOAT.

(*Hæmatopinus stenopsis* Burmeister.)

We have no record of this species having been observed in this country, and judging by the references to it in standard works it must be of rather rare occurrence in countries where these animals are kept in greater abundance than here.

The species is not, so far as at present known, transmissible to any other domestic animal, and if ever becoming abundant will doubtless

yield to the treatment used for the other species, though the long hair would make some of them more difficult of application. On this account fumigation where possible would seem to be most practicable.

THE SHORT-NOSED OX-LOUSE.

(*Hæmatopinus eurysternus*, Nitzsch.)

This is the species that has probably been familiar from early time as the louse infesting cattle, though since this species and the following one have been generally confused, it is impossible to say which has been most common. It was first accurately described by Nitzsch under the name of *Pediculus eurysternus*, in 1818 (Germar's Mag., vol. III, p. 305), and has received mention in every important treatise on parasites since that date, as well as innumerable notices under the head of animal parasites, cattle lice, etc. As with other species, the disease produced has been termed phthiriasis, and as treated by Kollar and other writers it has been recognized as a most serious pest and numerous remedies tried for its suppression.

Since it has been very generally confused with the following species we shall give more particular description and show as clearly as possible how to distingush them. The following quotation from Mr. C. W. Tenney (in Iowa Homestead for August 18, 1882) will show that this difference is not without interest or value as viewed by a practical breeder: "Then there is a blue slate-colored louse and a larger one of the same color that vary somewhat in their habits, and the last-mentioned is the hardest to dislodge." Evidently it is the species under discussion to which Mr. Tenney refers as the "larger one." It infests particularly the neck and shoulders, and these parts are frequently worn bare by the efforts of the animal to rid itself of the irritation produced by these unwelcome visitors. Still, some cattlemen say that these parasites are of no consequence, and that they never pay any attention to them.

The full-grown females are about one-eighth to one-fifth of an inch long, and fully half that in width, while the males are a little smaller and proportionately a little narrower. Aside from the difference in size the sexes differ very decidedly in the markings and structural features upon the under side of the body. The males have a broad black stripe running forward from the end of the body to near the middle of the abdomen, as shown in Fig. 6*c*.

The females have no indications of this stripe, but the black broken band of the upper side of the terminal segment extends slightly around on the under side. The most important character, however, is the presence of two little brush-like organs on the next to the last segment, as shown in Fig. 6*d*.

The head is bluntly rounded in front, nearly as broad as long, and with the antennæ situated at the sides midway from the posterior to the

anterior borders; behind these are located slight eminences upon which may be found the small eyes, which are seen with considerable difficulty. At the front of the head may be seen the small rostrum or beak, the end of which is usually at or near the surface, but which is capable of extension and retraction. The end of this beak is armed with a double row of recurved hooks (see Fig. 6*b*). The function of these hooks is

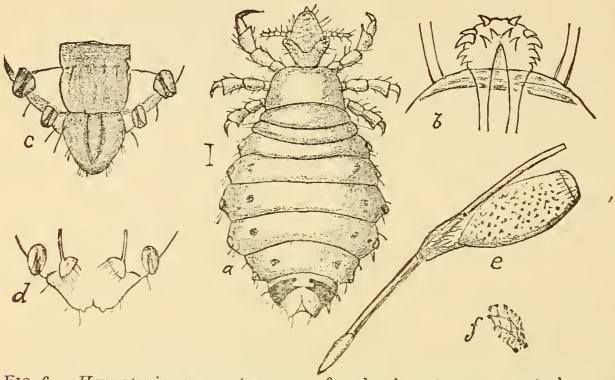

FIG. 6.—*Hæmatopinus eurysternus; a*, female; *b*, rostrum; *c*, ventral surface last segments of male; *d*, female; *e*, egg; *f*, surface of egg greatly enlarged. (Original.)

doubtless to fasten the beak firmly into the skin of the host, while the true pumping organ must consist, as in the *Pediculi*, of a slender piercing tube, though we can see only slight indications of this tube within the head, and we have not seen it nor do we find any record of its having been seen fully extended in this species. Professor Harker says the rostrum can be pushed out, but his figure shows only the basal portion with the crown of hooks and nothing of the tubular parts inclosed within.

The thorax is wider than long and widest at the posterior margin where it joins the abdomen. The legs project from the side, are long and stout, and especially adapted to clasping and clinging to the hair. An extra provision for this purpose consists of a double plate having fine transverse ridges in the basal joint of the tarsus. This structure appears to have been first described by Professor Harker (Agricultural Students' Gazette, vol. I, p. 162). The abdomen differs greatly in form and size, according to the degree of distention, which accounts for the discrepancies in the different figures of this species. It may be called flask-shaped and more or less flattened according to the amount of matter contained in it. There is a row of horny tubercles along each side and a row of chitinous plates along each side of the upper surface of the abdomen. The spiracles are located in the tubercles at the sides, and there is one to each of the last six segments omitting the terminal one. In color there is some variation, as would be surmised from a comparison of descriptions by different authors. The general color

of the head and thorax is a light brown approaching to yellowish, with touches of bright chestnut on the head and legs and margins of the thorax, also touches of dark brown on these parts, more particularly on the dorsal portion of the thorax. The abdomen in fresh specimens has a general bluish aspect, not so noticeable in preserved specimens, besides its color depends evidently in large degree upon its contents. Denny says "grayish-white or ochraceous gray," which would apply well to preserved specimens, but his plate shows it a blue-gray. Harker says brownish gray. It appears to us that the term used by Mr. Tenney, blue slate-colored, comes quite as near describing the average appearance as any that we have seen. The tubercles at the side of the abdomen and the chitinous plates are chestnut-colored, while the most of the upper surface of the terminal segment in the female and the ventral stripe in the male are black.

The females deposit their eggs on the hair, attaching them very near the skin. Fig. 6, *e* represents one of the eggs, showing its attachment to the hair and the distance from the root of the hair in the specimen drawn. The adhesive substance evidently invests the egg during oviposition and is touched to the hair, the egg then slightly drawn along so as to leave th e glue-like mass to form a firm union around the hair and to the egg. The egg is elongate-oval, tapering at the lower end, and having a cap-like covering at the upper end. The surface is set with very minute points just visible under an inch objective, but showing clearly with a power of 300 diameters. At the surface no connection is to be seen between different points, but focusing a little below the surface brings into view what appear to be minute threads or channels running from point to point and giving a reticulate appearance to the eggshell. The points can not correspond to the circular bodies represented in Denny's figure (E, Plate XXV, Monog. Anop. Brit.) which have much more the appearance of protoplasmic granules of the egg contents. The shape of the egg in his figure is also entirely different from that of the specimen from which our figure is drawn.

The young louse escapes from the outer or unattached end, whether by pushing off the cap-like portion or by simply pushing through this portion which appears to be thinner than the rest and may be simply membranous, is not, so far as we know, determined. No marked changes, except in size and the development of the chitinous patches, occur from hatching to maturity.

This is one of the most difficult parasites to destroy, and once settled upon an animal should receive prompt and thorough treatment. The main reliance of veterinarians seems to be stavesacre, and this can doubtless be depended upon to accomplish the desired end. Mr. Tenney recommends the seed of common larkspur steeped, and the animal thoroughly washed with the liquid. He says: "I have known one application to destroy every insect and egg; two will suffice if done thoroughly." Of course this and the stavesacre are nearly identical,

both plants belonging to the genus *Delphinium*. Washes of carbolic acid soap or of tobacco infusion are also effectual, but washes of any kind are of course illy adapted to use in midwinter, the time when there is frequently most necessity for treatment. Mercurial ointment, sulphur, or tobacco smoke, kerosene and lard, or kerosene emulsion, road dust, ashes, etc., may be resorted to, according to the circumstances. Infested animals should, if possible, be placed apart from the others, and much trouble may be saved by this precaution.

Experiments with fumigation have shown this to be a method available when other plans are undesirable, though from the equipment necessary, and the fact that it requires some time in application, it may not prove of as general service as the washes.

The method may be said in brief to consist of a tight box-stall just large enough to admit the largest animals to be treated, one end having a close-fitting door to admit the animal, the opposite end a stanchion in which the animal is fastened, and covering the open part of this end, and made to fit tightly around the head just in front of the horns, is a canvas sack open at both ends, the inner one nailed to the stall and the outer with a running cord to draw it down to the animal's head, thus leaving the eyes and nose in open air. An opening at the bottom of one side admits the fumigating substance, sulphur or tobacco, the latter apparently the most effective. In burning this we used a wire screen to spread the tobacco, placing this over a tin trough containing a small quantity of alcohol. It should be burnt, however, with coals or by using a small quantity of kerosene. The time of exposure necessary will vary some with the strength of fumes, but one to two ounces of tobacco and exposure of 20 to 30 minutes was found effective. Pyrethrum might be better even than tobacco.

This species has been said to occur also on horses, but if this is the case it must be in rare instances, and there need be little apprehension of horses becoming infected with it by transmission from cattle with which they may be associated.

THE LONG-NOSED OX-LOUSE.

(*Hæmatopinus vituli* Linn.=*tenuirostris* Burmeister.)

In connection with the preceding species this louse, as already stated, has long been familiar to cattlemen; it has also been known to entomologists for a considerable time, but its history from the entomological side is not entirely clear. It seems to have been first technically described by Linnæus under the name of *Pediculus vituli*, which name has been followed by Fabricius, Berkenhout, Stuart, and Turton, and, with the exception of the change in the generic name, by Stephens, Denny, and English and American authors generally. Nitzsch described it

under the name of *Pediculus oxyrhynchus*, which name was Latinized by Burmeister to *tenuirostris*. This designation has been followed by Giebel and Piaget, but why the earlier name of Linnæus was dropped we fail to discover. It seems more proper to retain the name given by Linnæus.

Denny describes and figures the species and says that it has been found only on the calf. Giebel also figures and describes it, giving a very characteristic figure, though deficient in some details. Piaget admits the species provisionally, but questions it being separable from *eurysternus* from the fact that descriptions have been based only on female specimens or on those in which the sex was not distinguished, and he seems to think it probable that immature specimens of *eurysternus* may have furnished the basis for this form.*

From material in hand there can be no question whatever as to there being a distinct form corresponding with the descriptions above cited, and while there are some details still to be cleared up we propose to show as fully as possible the differences. While our material does not include any specimen that can be recognized as a male, it does include enough specimens of the early stages and females of both this species and the *eurysternus* to entirely set at rest any question as to immature forms of *eurysternus* having been described as *vituli* or *tenuirostris*.

In this species the body is about one-eighth of an inch long and not more than one third of that in width (see Fig. 7). The head is long and slender, the antennæ set near the middle each side; there is but a very slight protuberance behind the antennæ and no eyes visible. The head sets well back into the thorax, forming an acute angle behind; the thorax is longer than wide, and has a distinctly showing spiracle above the second pair of legs; the abdomen is elongate, without chitinous plates and devoid of any tubercles along the sides; the terminal segment is also devoid of black horny band; the brush-like organ on the under side of the abdomen (see Fig. 7) is slender, while the terminal segment is set with numerous rather long hairs.

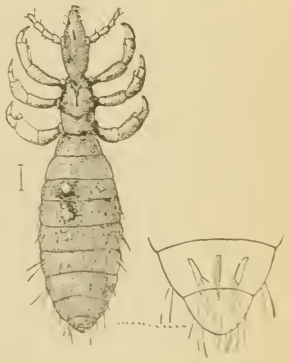

FIG. 7.—*Hæmatopinus vituli*, and under surface of last segments of female, showing brush-like organs. (Original.)

In all of these points it will be observed there is a distinct difference from *eurysternus*. The brush-like organ on under surface of the abdomen, common to females of related species and which is wanting in young specimens of all species, must be taken as distinct evidence of the ma-

* Since the preparation of this section and the figures illustrating the species I have seen the supplement to Piaget's Les Pediculines and find that he now admits this as a good species and gives a figure of the female, without, however, any special details of structure.

turity of the specimens. If, however, there were any doubt on this point a study of the young of *eurysternus* gives equally conclusive testimony. In the very youngest *eurysternus* we have seen the chitinous tubercles along the sides of the abdomen inclosing the spiracles are distinctly to be seen, while the head, though longer proportionately than in adults, is by no means equal in length to that of adult *vituli*. A young *vituli* found, it is true, associated with *eurysternus* shows this elongation of the head still more markedly. In color there is little difference in the two forms, this species having rather duller colors upon the head and thorax. The abdomen of young specimens, when full of blood, appears dark red, but the bluish-gray hue is more prominent in adults. The eggs of this species have not been described and we have not had the good fortune to discover them. The young are even more slender than the adults.

The remedies that are available for the preceding species will prove effectual for this, and it is evidently less difficult to subjugate than that form.

THE BUFFALO LOUSE.

(*Hæmatopinus tuberculatus* Burm.)

This species was described by Burmeister (Gen. Ins.) under the name of *Pediculus tuberculatus*.

It is described in Giebel's Epizoa, p. 46, and described and figured by Piaget (Les Pedic., p. 650, Pl. 53, Fig. 2). It is compared by Giebel with the hog-louse and by Piaget with the *H. eurysternus*, which from his figure it seems most nearly to resemble. According to Piaget this species is probably identical with the *Pediculus* (*H.*) *phthiriopsis* of Gervais, (Apteres, III, 306) from the *Bos cafer* and with the *Pediculus* (*H.*) *buffali* of DeGeer (Mem., VII, 68), in which case the name given by DeGeer should be adopted for the species. Rudow (Zeits f. d. ges Naturw., XXXIV, 167) describes a species under the name of *Hæmatopinus punctatus*, from the *Bos grunniens*, which possibly will be found referable to this same species.

Whether the same species occurs on our American bison is not known, but the unfortunate extermination of this animal renders the question, from a practical standpoint, of little importance. Lucas describes and figures the species in the Annales de la Société Entom. de France (1852, ser. 2, tom. X, p. 531, Pl. 11, No. II) referring it to the species described by Burmeister in 1838 in the "Genera Insectorum." Specimens, he says, occurred in immense numbers on a *Bos bubalus* in the Museum of Natural History.

THE HOG-LOUSE.

(*Hæmatopinus urius* Nitzsch.)

Occasionally this species appears in formidable numbers, since we often hear of swine badly affected with lice, and no other species is known to attack this animal.

Giebel credits this species to Moufet, citing the Theatrum Insector. (1634, 266), while Piaget states that it is cited by Moufet on the authority of Albertus (IV., C. 205), which would carry its recognition back to the thirteenth century. Linnæus described it under the name of *Pediculus suis*, which name has been most commonly followed, but Nitzsch revived the name of *urius* and this name has been followed by Giebel and Piaget. Along with other parasites it received frequent mention by both early and modern writers. Denny speaks of it as rare in England, but common in Ireland. He says (Monog. Anop. Brit., p. 35):

"This species is found in great numbers on swine, but it does not appear so generally spread as might be expected from the dirty habits of the animals. It most frequently occurs on those fresh imported from the sister isle. It was many months before I could obtain a single example. I had applied to both farmers and pig butchers, neither of whom seemed to approve of the idea which I had conceived, that of *their* pigs being *lousy*, but referred me to those of the Emerald Isle as being sure to gratify my wishes (forgetting, I suspect, that the Irish pigs come to this market to meet English buyers). I accordingly visited a colony just arrived, where I most certainly met with a ready supply; but here they were confined almost entirely to lean animals, and wherever I found a pig fat or healthy no game were to be seen."

Most stockbreeders have probably seen instances of its abundance, and from the frequent mention of it in the agricultural papers, it would seem to be quite common throughout the country, and while, perhaps, less generally distributed than the ox-louse, to multiply some times so as to cause much more apparent damage to its host. The fact that they are more commonly found on poor or runty animals should not be taken as evidence that they have a preference for such animals, but rather that the animals upon which they have multiplied rapidly have, in consequence, become emaciated and unhealthy. That they do not increase more rapidly and become a much greater nuisance may be in part because the majority of hogs are sold and slaughtered at a comparatively early age, and with each one slaughtered must perish the parasites which have been supported by it, unless, perchance, an occasional one escape the scalding trough and succeed in finding another host. Of the vast number of hogs shipped to market and slaughtered at the great packing houses, none can bequeath the insects they have nurtured to their followers. The amount of injury and the consequent need of precautionary measures are, therefore, much less for this species than for many others.

This is one of the largest species of the family, full grown individuals measuring a fourth of an inch or more in length. It is of a gray color, with the margins of the head and thorax and most of the abdomen dark. The head is quite long, the sides nearly parallel, with strong eminences just back of the antennæ, which are set on the sides of the head, midway from rostrum to occiput; the legs are lighter with dark

bands at the joints; the spiracles are inclosed by a black chitinous eminence, and there is a broad black band on the last segment, broken near the middle. (See Fig. 8.)

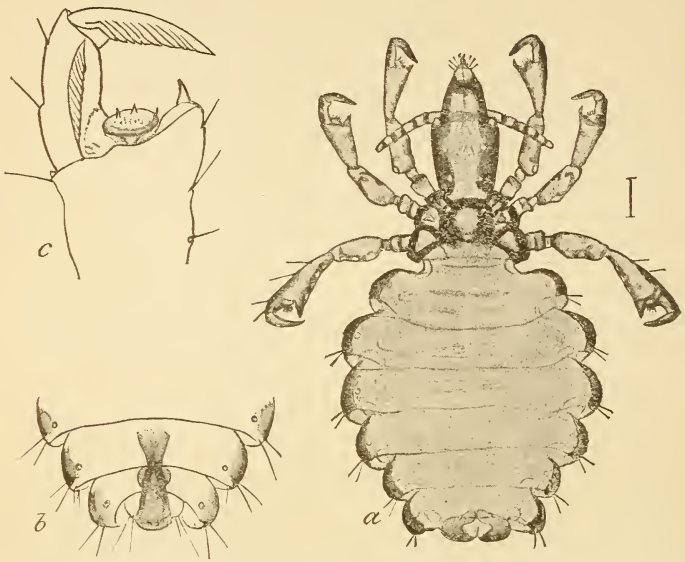

FIG 8.—*Hæmatopinus urius*: *a*, female; *b*, male, ventral view of posterior segments; *c*, leg, showing protractile disk of tibia. (Original.)

The male has the abdomen marked beneath with a large black area extending forward from the end of the terminal segment, so as to occupy the central portion of the last three segments.

There is a curious provision in the feet for strengthening the hold upon the hair, which does not seem to have been hitherto described.

It consists of a circular pad-like organ or disk in the outer portion of the tibia which is received in a conical cavity in the end of the tibia, and which can be forced out so as to press upon the hair held between the claws of the tarsus and the end of the tibia.

Ordinarily, and always in the dead specimens, this is withdrawn so as to appear simply as a part of the end of the tibia, and the spines located on its margin, appear to belong to the tibial rim, but if examined with sufficient magnification when the louse is alive it is easy to observe the extrusion of the organ.

Whether similar organs exist in related species is yet undetermined, but it seems quite probable that they should, since in the specimens examined microscopically we have usually to deal with dead and preserved individuals in which this structure would almost certainly escape notice.

The eggs are one millimeter and a half in length (.06 in.) by three-fourths of a millimeter in width (.03 in.). They are light yellow or dusky

whitish in color, and taper slightly to the point of attachment. The circular lid-like portion is large, occupying nearly all the surface of the free end of the egg. They are attached usually near the base of the hairs.

On account of the thinness of the hair, the application of remedies, where necessary, is quite easy. Washes of tobacco water or dilute carbolic acid, and the application of kerosene in lard, or kerosene emulsion by means of force pump, sulphur, ointment, etc., are recommended. The application of fine dust may be provided for naturally by allowing the hogs a chance to roll in a roadway or any place well supplied with fine dust. Where this is impracticable the dust, ashes, or powdered charcoal may be applied directly to the neck and back of the infested animal. The species is not known to attack any other of the domestic animals, and hence no precautionary measures in this direction are necessary.

THE SUCKING HORSE LOUSE.

(*Haematopinus asini* Linn.—*macrocephalus* Burm.)

Notwithstanding the probable frequent occurrence of this species we have as yet failed to meet with examples. The biting lice from horses have been secured in great numbers, but we have searched in vain for this one.

It is figured by Redi (Exp., Pl. XXII, Fig. 1) and was described by Linnæus under the name of *Pediculus asini*, presumably his specimens being taken from the ass. Later Burmeister described specimens from the horse under the name of *Pediculus macrocephalus*. Denny retains the name given by Linnæus and states that it is common upon the ass, and that he also had specimens from the horse, from which circumstance he suspected Burmeister's *macrocephalus* to be the same. Giebel and Piaget both follow the name of Burmeister, and Piaget separates as a variety the form occurring on the ass, and gives it the name of *colorata*.

It seems hardly probable that it occurs in this country in sufficient numbers to cause much trouble on horses. Possibly examination of mules, asses, or donkeys would show greater abundance from the fact that horses in general are more carefully groomed than their somewhat despised relatives. The size is about the same as that of the ox-louse, but it differs very decidedly in the form of the head, which is long, slender, and the sides of the head nearly parallel, as shown in the figure (Fig. 9), taken from Comstock's Introduction to Entomology.

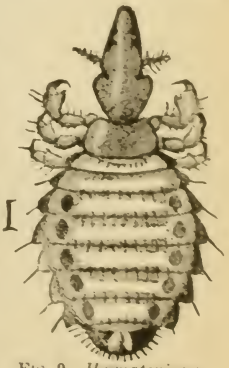

FIG. 9. *Hæmatopinus asini*. (From Comstock.)

Careful grooming may be looked upon as at least favorable to the reduction of numbers in this species. In case they become too numerous the application of a little kerosene to the card or curry comb used in grooming the animals will be

found of value. Where more vigorous treatment is necessary the measures recommended for the ox-louse may be adopted.

SUCKING LICE INFESTING THE RODENTS.

(*Hæmatopinus* sp.)

Belonging to the same genus of suctorial lice as those previously mentioned, we have a number of species common to the smaller mammals, particularly those of the group of gnawing mammals, the *Rodentia*.

These smaller mammals, though perhaps never strictly domesticated, save the rabbit, are very often kept in a semi-domesticated state, either as pets in zoölogical gardens or, in case of rats and mice, quite involuntarily because of our inability to entirely rid ourselves of them. A few notes on the lice infesting them will therefore be of interest here. It is desirable to be able to identify them in case of their accidental occurrence on other mammals, and thus to be able to determine whether, in such cases, we have to deal with a species likely to prove of any trouble.

The common rat (*Mus decumanus*) supports a species, *Hæmatopinus spinulosus*, which with its host must be distributed over most of the world. It has been taken at Ames, Iowa, though in small numbers, and it seems to be rather scarce. It is not recorded heretofore for this country so far as we know, and many animals were examined before finding specimens; a fact in part due, perhaps, to its minuteness.

It is a small species of a light yellow color, the head projecting very little in front of the antennæ and the thorax very short. The mice are said to harbor a distinct species, but there seems to be some doubt as to its being a genuine species.

Hæmatopinus acanthopus occurs on the field mice and has been taken at Ames from a species of *Arvicola*. It resembles the preceding in color and form, but is somewhat larger; the egg presents some peculiarities, which are described in detail in the appendix.

Other species described in European works are the *H. sphærocephalus* on *Sciurus vulgaris*, and *H. læviusculus* on *Spermophilus eversmanni*, and two species, *H. lyriocephalus* and *H. ventricosus*, on rabbit or hare. These have not been met with as yet in this country.

Specimens have been taken from our common flying squirrel, fox squirrel, ground squirrels, and chipmunk, and also from the white-footed mouse and the pocket gopher, which do not appear to have been previously described, and these will be found described in detail in the appended note.

THE ELEPHANT LOUSE.

(*Hæmatomyzus proboscideus* Piaget.)

This louse, infesting the elephant, is about as exceptional in its way as the animal which harbors it. It appears to be of quite recent notice, though it is not unlikely that it has been known in countries

where the elephant has been domesticated for an indefinite length of time.

FIG. 10. — *Hæmatomyzus proboscideus.* (After Murray.)

It was described by Piaget (Tijdschr. voor. Ent., 2d series, IV, 254) in 1869, under the name of *Hæmatomyzus elephantis.* The same author, however, in his elaborate monograph, *Les Pediculines*, changes the name to *H. proboscideus.* This louse differs from the others of the family in having a slender prolonged snout extending in front of the head. The antennæ are located at the base of this snout, and according to Murray are lenticular in form. In Piaget's figure, however, they appear of nearly equal thickness throughout. "Color reddish, madder brown, smooth, shining, impunctate." (Murray.)

TECHNICAL DESCRIPTIONS OF NEW SPECIES.

LOUSE OF THE FIELD MOUSE.

(*Hæmatopinus acanthopus* Burm.)

Apparently common on our species of Arvicola, and does not appear to vary in any important particular from the descriptions of European specimens.

DESCRIPTION OF THE EGG.

The egg in this species, unlike those of other forms we have met, is attached to a bundle of hairs instead of to one, our specimen thus having attachment to four hairs, as shown in Fig. 11. This would seem to be an excellent provision where the hair is so fine as in these animals.

The egg is elongate oval, broad, and somewhat truncate at the attached end; the surface is roughened, rugulose, or foveolate appearing squamous in places, and in section showing rounded pits on the surface; the investing substance at base is slightly corrugated. See Fig. 11*e*.

The larva is much shorter and thicker in proportion than the adult, the spiny hairs of the abdomen wanting, but with one or two long slender hairs extending back from the terminal portion.

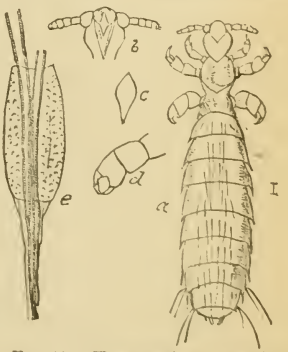

FIG. 11.—*Hæmatopinus acanthopus: a*, dorsal view; *b*, head; *c*, sternal plate; *d*, posterior leg; *e*, egg; all enlarged. (Original.)

LOUSE OF THE FLYING SQUIRREL.

(*Hæmatopinus sciuropteri* n. sp.)

Body slender, light yellow, head as broad as long, expanding laterally at the posterior border above and with an acute angle behind; beneath triangular and running back to a sharp angle between the anterior legs, the front projecting very slightly beyond the antennæ, very slightly convex, the rostrum located back of the anterior

border; the trophi plainly visible passing back into the prothorax; the antennæ very large and strong, first joint much the largest, occupying in its attachment half the lateral margin of the head; second joint ordinary, third joint very short, but the anterior portion extending to more than usual length and appearing like a process and bearing a stiff hair and two or three tooth-like spines; the fourth joint attached apparently very near the base of the third on posterior side and of usual length; the fifth joint short, the terminal pit with two or three short hairs; the postero-lateral angles of the head armed with a long stiff hair.

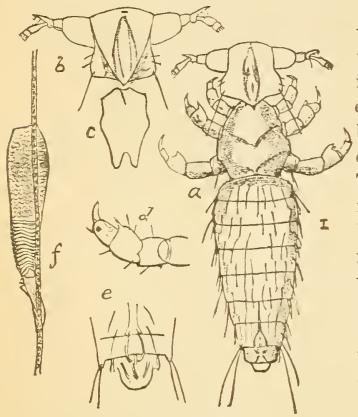

FIG. 12.—*Hæmatopinus sciuropteri*: *a*, male, dorsal view; *b*, head, ventral view; *c*, sternal plate; *d*, leg; *e*, terminal segments; *f*, egg; all enlarged. (Original.)

Thorax widening from before backward, longer than its greatest width, lateral borders irregular, the posterior border concave; the sternal plate is very large, emarginate in front and a large emargination corresponding to each leg, deeply bilobed posteriorly; anterior legs not half the size of the others, claws weak; posterior legs largest. These and second ones provided with strong clasping claws, or terminal joint of tarsus, opposing basal joint of tarsus, which is provided with corrugated plate; tibia at apex internally provided with a short toothed spine.

Abdomen of eight segments, elongate, each segment sparsely set with short, very stiff hairs, those at lateral angles spine-like; penis distinct, of ordinary form. (See Fig. 12.)

Egg elongate ovate, attenuated toward the attachment, the surface with faint reticulations having form of scales; the basal half of the egg has the walls beautifully corrugated. (See Fig. 12.)

	Millimetres.
Length	1.20
Width	.33
Head:	
Length	.27
Width	.26
Thorax:	
Length	.27
Width	.30
Abdomen:	
Length	.73
Width	.33
Antennæ, length	.16
Posterior femur, length	.10
Posterior tibia, length	.10
Egg:	
Length	.80
Width	.18

This species, in the form of the head and the character of the antennæ differs very decidedly from most of the other members of the genus and is readily distinguished by the se characters as also by the form of the sternal plate.

One specimen male and one egg taken from different specimens of the flying squirrel *Sciuropterus volucella*, but undoubtedly belonging to the same species. Collected at Ames, Iowa.

LOUSE OF THE FOX SQUIRREL.

(*Hæmatopinus antennatus*, n. sp.)

Body long and slender, the abdomen proportionately large.

Female.—Head narrow and rounded in front, widening decidedly behind the antennæ, deeply hollowed beneath the lateral margin, the postero-lateral margin sub acute, bearing a short spine-like hair and a long stiff hair, the posterior border with an acute angle behind; beneath broadly keeled, keel behind narrow, expanding in front to width of head between the antennæ. Antennæ very different from other members of the genus; the first joint large with a short process on the posterior border bearing a sharp inwardly curved tooth; other joints ordinary, second joint longest. Thorax short, widest behind, sternal plate ovate, broadest in front, legs as with allied forms, the posterior pair strongest. Abdomen long, lateral angles produced, bearing a short spine or tooth, a short stiff hair and a long hair; a tuft of hairs on lateral angles of the eighth segment. Egg elongate ovate, surface smooth throughout except at the cap, which is strongly convex and has a row of perforations near the attachment to the body of the shell.

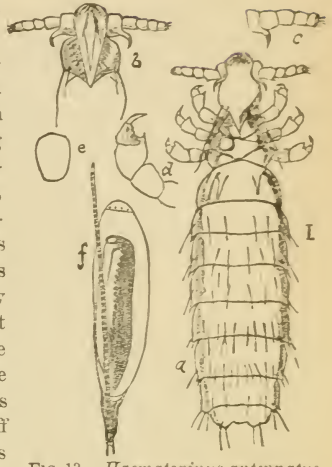

FIG. 13.—*Haematopinus antennatus*: *a*, dorsal view; *b*, head, ventral view; *c*, antenna; *d*, leg; *e*, sternal plate; *f*, egg; all enlarged. (Original.)

	Millimetres.
Length	1.55 to 1.65
Width	.50
Head:	
Length	.35
Width	.20
Thorax:	
Length	.13
Width	.22
Abdomen:	
Length	1.20
Width	.50
Antennæ, length	.20
Egg:	
Length	.73
Width	.28

This species is at once distinguished from all others, known by the peculiar structure of the antennæ, no other species described possessing the process and curved tooth of the basal joint. In form of head it approaches *acanthopus*, but is larger than that species and has the sternal plate of different forms. The egg is longer, more attenuated in form at base, and devoid of the surface markings characteristic of that species. Collected from a fox squirrel, *Sciurus cinereus* var. *ludovicianus*, at Ames, Iowa.

LOUSE OF THE WHITE FOOTED MOUSE.

(*Hæmatopinus hesperomydis*, n. sp.)

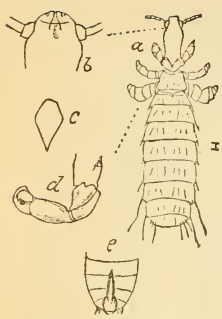

FIG. 14. *Hæmatopinus hesperomydis* — *a*, dorsal view; *b*, head; *c*, sternal plate; *d*, posterior leg; *e*, terminal segments, male; all enlarged. (Original.)

Body elongate, general color golden yellow.

Female.—Head subquadrate, rounded in front, a concavity for the rostrum, obtusely angulated on the posterior border; antennæ set near the front; first joint large, short; second longest, the rest nearly equal; fourth with a small tooth on the posterior border, terminal pit with several short hairs. Thorax shorter than the head, small, sternal plate cuneiform, obtusely angular, irregularly or obliquely truncate in front and sharply pointed behind; anterior legs small and weak, the middle ones somewhat larger, the posterior pair much the largest, flattened; terminal joint of tarsus very broad and curved, opposing basal joint of tarsus and meeting tibial spur in such manner that the three form almost a complete cylinder; abdomen oval elongate, sparsely set with short spiny hairs, one or two long hairs at lateral angles of sixth and seventh segments.

Male, more slender, head longer and tapering somewhat toward the front. See Fig. 14.

Egg, as seen in the body of adult female specimen, is elongate oval.

	Millimetres.
Length	.75 to .90
Width	.28 to .33
Head:	
Length	.13 to .16
Width	.10
Thorax:	
Length	.10
Width	.13 to .15
Abdomen:	
Length	.50 to .60
Width	.28 to .33

The species approaches the *acanthopus*, resembling it in the form of the sternal plate, the character of the legs, and the general form of the body. It differs, however, in having the sternal plate less narrowed posteriorly, more obtuse, or even truncated in front; more decidedly still in the form of the head, which is longer and less excavated for the insertion of the antennæ. It is also smaller, and the egg, if we may judge by what we can see through the walls of the female, is more elongated.

It has been collected from the white-footed or deer mouse, *Hesperomys leucopus*, at Ames, Iowa.

LOUSE OF THE GROUND SQUIRRELS AND CHIPMUNK.

(*Hæmatopinus suturalis*, n. sp.)

Body short, broad; color, golden yellow.

Head oval, rounded and deflected in front; a large chitinous ring inclosing the base of the rostrum; a very distinct transverse suture behind the antennæ; sides slightly convex; lateral angles obtuse, without hairs; posterior angle acute, and passing well back upon the thorax; antennæ simple, located anterior to the middle of the sides; joints nearly equal in size. Thorax short, convex at sides, widest behind, sternal plate nearly circular, surface roughened; anterior and middle legs slender and nearly equal in size; claws slender and sharp; posterior legs very thick, claw strong and broad. Abdomen short, ovate, broadest near the front, sutures inconspicuous, hairs long; some of those on sides and posteriorly very long. Males and females are very similar, and distinguishable only by genital armature of male.

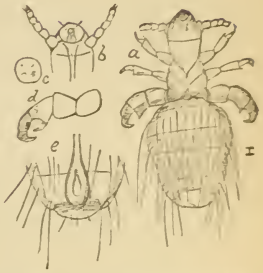

FIG. 15. *Hæmatopinus suturalis*: *a*, dorsal view; *b*, head; *c*, sternal plate; *d*, posterior leg; *e*, terminal segments, male; all enlarged. (Original.)

	Millimetres.
Length	.75 to .80
Width	.35 to .40
Head:	
Length	.27
Width	.13
Thorax:	
Length	.13
Width	.18
Abdomen:	
Length	.45 to .48
Width	.35 to .40

This species is particularly well marked by the general form of the body and especially by the conspicuous transverse suture back of the antennæ. It differs further from most of the species in the genus in having both the anterior and middle legs slender and of nearly the same size, while the posterior legs alone are especially modified as clasping organs.

Although we have not seen Middendorf's description and figure of *H. lævisculus* from *Spermophilus eversmanni*, there can be scarcely a possibility of this being identical with it, since this differs in almost every particular as compared with the diagnoses of that species given by Giebel and by Piaget. We therefore describe it without hesitation as a new species.

It has been found plentiful on *Spermophilus franklini* and *S. 13-lineatus* at Ames, Iowa. An immature specimen from *Tamias striatus* presents the characters of the species so plainly that there can be little doubt that it is identical.

HÆMATOPINOIDES.

Nov. Gen.

Antennæ composed of three joints, terminal joint deeply excavated on the posterior side; abdominal segments at lateral margins broadly chitinous with a strong tubercle and a semicircular plate above and below lapping over the chitinous portion of the succeeding segment.

SUCKING LOUSE OF THE POCKET GOPHER.

(*Hæmatopinoides squamosus*, n. sp.)

Body oblong, broadly flattened; general color, dark yellowish. Head small, longer than broad, narrowly rounded in front, widening behind the antennæ; lateral angles rounded, posterior margin acutely pointed beneath, with two large hairs set between the bases of the antennæ and directed outward; antennæ composed of but three joints, these being nearly equal in size, the first short, stout; the third longest and with a deep excavation on the posterior side. Thorax small, broader than long, margin irregular, sternal plate obtusely angled in front; lateral margins parallel, passing by obtuse angles into an acutely angled posterior extremity; immediately back of the sternal plate are two irregularly triangular, chitinous plates, occupying the region of the metathorax and extending each side so that their bases reach to the bases of the coxæ. Anterior and middle legs of nearly the same size, hind legs larger, stouter, and better fitted for clasping. Abdomen large, oblong or elliptical, broadening very rapidly at base and terminating abruptly; lateral margins of segments broadly chitinous, a strong tubercle directed posteriorly and a semicircular plate above and below lapping over the chitinous portion of the succeeding segment, spiracle located at middle of lateral margin; median portion membranous, appearing minutely squamous. The sutures of the segments faintly indicated, a few long hairs scattered over the median portion of the dorsal surface, two hairs on each lateral tubercle, these much elongated on segments 6 an 7; the eighth with a tuft of hairs.

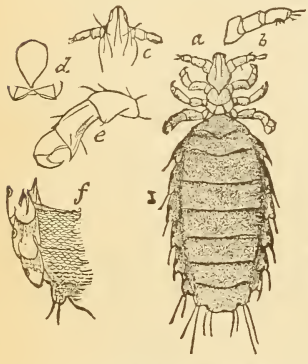

FIG. 16.—*Hæmatopinoides squamosus*: *a*, female dorsal view; *b*, antenna; *c*, head; *d*, sternal plate; *e*, posterior leg; *f*, border of abdomen; all enlarged. (Original.)

	Millimetres.
Length	1.20
Width	.50
Head:	
Length	.27
Width	.13
Thorax:	
Length	.13
Width	.20
Abdomen:	
Length	.87
Width	.50
Antennæ, length	.10

This species departs so remarkably from others of the group that it seems necessary to create for it a new genus. The most important characters and those which seem of generic value are the three-jointed antennæ and the semicircular plates on margins of the abdomen. The sternal structure is also different. In general aspect, however, it approaches the genus Hæmatopinus.

Two specimens, both females, collected from the pocket or pouched gopher, *Geomys bursarius*, at Ames, Iowa.

ORDER PSEUDONEUROPTERA.

SUBORDER MALLOPHAGA.

This group embraces all the biting lice infesting birds and mammals. They are very distinct, indeed, from the preceding group, though frequently placed with them under such unnatural divisions as *Anoplura*, *Pediculines*, etc.

The bodies are usually hard and horny and much flattened. They possess mandibulate mouth parts adapted to cutting and biting the hairs, feathers, epidermal scales, or excretions on the bodies of their hosts. They are said also to have a suctorial organ by means of which they may at times draw blood from the host animal. The mandibles are situated in most forms underneath the head and near the center, the clypeus projecting and forming the most anterior portion of the head. The labrum is present and the maxillary palpi are prominent in a part of the order. The eyes when visible are located back of the antennæ. The antennæ are five-jointed except in *Trichodectes*. The thorax is generally narrow and frequently but two divisions are apparent. The legs are adapted to clasping (*Philopteridæ*) or to running (*Liotheidæ*), the tarsi in the first case being short and fitted for clasping against the tibiæ, and in the second case being long and provided with two claws well adapted to running. The members of the first division occur on both mammals and birds, those of the second, except *Gyropus*, are limited to birds. Wings are entirely wanting and the abdomen contains nine or ten segments and is usually oval in shape.

In life history this group agrees with the preceding. The eggs are glued to the hairs or feathers of the host animal and open with a circular cap or lid at the free end. The larvæ are less flattened, shorter in proportion, and without the hardened parts common to the adults covering a part or all of the surface. The length of life and rapidity of multiplication has not been determined for any species so far as we know, and the habits of the insects make any such determination a matter of great difficulty.

The effect of these upon the host animal may be less important than that of the suctorial lice, but judging from cases where serious results follow from the efforts of the animals to rid themselves, and from the known irritation due to the crawling of anything among hairs and feathers, it can not be doubted that they cause much inconvenience to the creatures which become their involuntary supporters.

The order may easily be separated into two families upon characters a part of which have already been mentioned, namely, the structure of the mouth parts and the feet. The latter, which is the most easily observed, can easily be told from the mode of locomotion, the members of the first group being incapable of rapid movement but well adapted to clinging to the hairs or feathers, the latter running freely and swiftly but having less power to clasp.

FAMILY PHILOPTERIDÆ.

Infesting horses, cattle, sheep, dogs, cats, chickens, turkeys, pigeons, ducks, etc.

The members of this family have the mouth parts on the under side of the head. Mandibles strong; maxillæ wanting; tarsi short, of one or two joints, the claw meeting a tooth at the apex of the tibia; mesothorax apparently wanting; abdomen having nine segments.

The group is a large one, the species being so numerous that scarcely a bird but harbors one, and sometimes several, species of this family.

The genera are, for the most part, easily separated; *Docophorus*, by the presence of a movable appendage (trabecula) in front of the antennæ; *Nirmus*, by the presence of an immovable tooth in front of the antennæ and the generally entire terminal segment of the abdomen of the female. *Goniocotes* and *Goniodes* are robust forms, usually with large heads strongly curved in front; they differ by the former having simple antennæ in both sexes, while in the latter they are modified in the male. The former are also usually much the smaller. In *Lipeurus* the body is generally long and slender, the antennæ of the males large and often with a complicated structure, while the terminal segment of the female is bilobed. The species of *Ornithobius* are white or transparent and especially characterized by having sharp curved appendages meeting in front of the clypeus. *Trichodectes* is at once known by the three-jointed antennæ. Other genera of the family do not contain species infesting domestic animals, and hence need not be noticed here.

LOUSE OF DUCKS AND GEESE.

(*Docophorus icterodes* Nitzsch.)

This species has been recorded from so many different members of the order of birds containing the ducks and geese that it may be considered as common to the order. It was described by Nitzsch in 1818 and has been mentioned by most writers on parasites since that time. It is about 1 millimetre in length, and has the head and thorax of a bright reddish color with darker bands. The abdomen is white in the center, with broad, dark reddish, horny bands at the sides, with a darker spot at the margin.

THE LITTLE RED SWAN-LOUSE.

(*Docophorus cygni* Denny.)

Notwithstanding the apparent abundance of this species it does not appear to have been described before 1842, when it was described and figured by Denny (Monog. Anop. Brit., p. 95, Pl. 1, Fig. 1), but according to this author it was figured by Redi (Exper., Pl. IX, fig. inf.), which would carry its recognition back 200 years. It is common on both the wild and domesticated swans, and Denny states that he has received it from the bean goose.

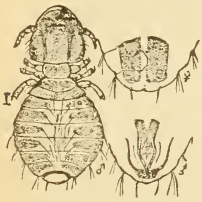

FIG. 17.—*Docophorus cygni.* (Original.)

It is a millimetre in length, of a robust form, the head decidedly rounded in front, except at the extreme tip, where it is slightly excavated. In color the head, thorax, and legs are bright reddish brown, while the abdomen is white in the center and dark brown at the sides, the brown occupying hard plate-like portions at the side of each segment.

The form and the distribution of these plates are shown in the accompanying figure.

CHICKEN LOUSE.

(*Goniocotes hologaster* Nitzsch.)

This common species of the domestic fowl was recognized by DeGeer and by Nitzsch. It has been generally confused with another form, or rather another larger and perhaps more common form has been generally accepted by English and American writers as the *hologaster*, this being due to the description and figure given by Denny, who does not seem to have seen the true *hologaster*, but described for it, according to Piaget, an immature specimen of the larger species since described as *Goniocotes abdominalis* Piaget.

The *hologaster* is only about one millimetre in length, whereas the *abdominalis*, or Denny's *hologaster*, is about three millimetres. In general form the species is somewhat similar, the *hologaster* being less constricted at the thorax and more regularly tapering to the end of the abdomen. The head is more nearly quadrate; the abdomen not so conspicuously marked, the incurved margins of the segments not extending so decidedly upon the disk and presenting the distinct lines seen as a border to the fasciæ in *abdominalis*.

CHICKEN LOUSE.

(*Goniocotes abdominalis* Piaget.)

This is probably fully as common as the preceding species. As already stated, it is the form which has been commonly referred to in

English and American works as the *Goniocotes hologaster*, which doubtless accounts for its not having been described until quite recently.

FIG. 18.—*Goniocotes abdominalis hologaster* of Denny. (After Denny).

It is a large, conspicuous species, about 3 millimetres in length, quite broad, the head nearly circular in front and constricted behind, the thorax small, the abdomen widening to near the end and terminating abruptly. The head, thorax, and legs are yellowish, with dark margins and spots; the abdominal segments bear lateral whitish fasciæ bordered with black.

It appears to be much less common than some other species of chicken lice, notably *Menopon pallidum* and *Lipeurus variabilis*.

PIGEON LOUSE.

(*Goniocotes compar* Nitzsch.)

A species which has been familiar for a long time and generally common, along with other lice, on domestic pigeons. It is a rather small-sized species, a little more than a millimetre in length. The head is rounded in front, narrower between the antennæ, broadest near the posterior margin. The thorax is narrow, the abdomen in the male broadest near the posterior end and squarish behind, in the female more regular and broadest near the middle. It is whitish, with a rather broad brownish margin, from which prolongations extend inward upon the sutures.

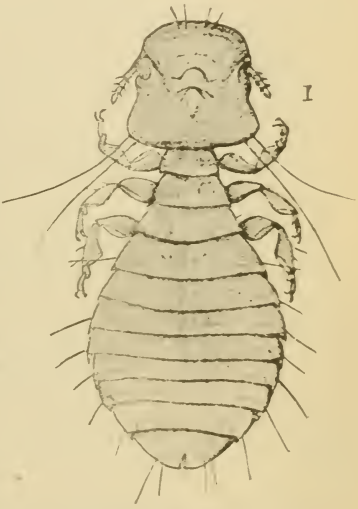

FIG. 19.—*Goniocotes compar*. (Original.)

THE PEACOCK GONIOCOTES.

(*Goniocotes rectangulatus* Nitzsch.)

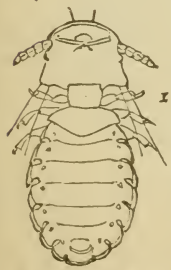

FIG. 20.—*Goniocotes rectangulatus*. (After Piaget.)

This species which shares with the *Goniodes falcicornis* the hospitality of the peacock, was first described by Nitzsch (Germar's Mag., III, 294). It is a small species, about the size of the *hologaster*, which it resembles quite closely. The head is squarish, somewhat rounded in front, while the thorax and abdomen are short and oval.

While less noticeable than the larger species associated with it, it is probably no less abundant.

BURNETT'S GONIOCOTES.

(*Goniocotes burnettii* Packard.)

A species described by Dr. A. S. Packard (Am. Nat. vol. IV, p. 94) is apparently much less common than some of the other species common to the sadly infested barnyard fowl. According to Dr. Packard's description it differs from the *G. hologaster* of Europe, which lives on the same bird, in the short second joint of the antennæ, which are also stouter, and in the long head, the clypeus being much longer and more acutely rounded, while the head is less hollowed out at the insertion of the antennæ. The abdomen is oval and one-half as wide as long, with transverse, broad, irregular bands along the edges of the segments. The mandibles are short and straight, two-toothed. The body is slightly yellowish and variously streaked and banded with pitchy black.

FIG. 21.—*Goniocotes burnettii* Pack. (After Packard.)

GONIOCOTES OF THE PHEASANT.

(*Goniocotes chrysocephalus* Giebel.)

This parasite of the pheasant was first described by Giebel in 1866 under the name of *Goniocotes colchici* which he afterward changed to the above. It is said to resemble the *hologaster* which affects the domestic fowl.

THE CHICKEN GONIODES.

(*Goniodes dissimilis* Nitzsch.)

Although this species has been known for a considerable time, it seems not to have been abundant enough to receive frequent notice.

Denny says: "I suspect this species of being of rare occurrence, as the only specimen which I have examined was communicated by Mr. Thompson from Belfast, and that being a female, I am precluded from describing the characteristics of the male."

It is a large species, 2 to 2½ millimetres in length, and Denny describes it as tawny in color, smooth, shining, and pubescent, with large subquadrate head, a short transverse prothorax, and a large abdomen with the side markings confluent, and the sutures with deep chestnut bands. It has not as yet been recorded for this country that we are aware of, though in all probability it occurs here as well as in Europe.

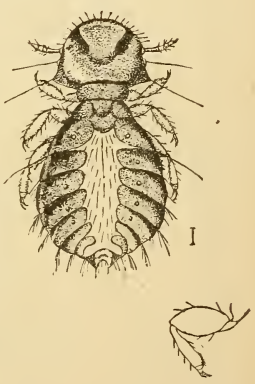

FIG. 22.—*Goniodes dissimilis.* (After Denny.)

LOUSE OF THE GUINEA FOWL.

(*Goniodes numidianus* Denny.)

We have only the record given by Denny (Monog. Anop. Brit., p. 163, Pl. XIII, Fig. 7) as authority for this species. His diagnosis of the species is as follows: "Pale straw-yellow, shining and smooth, margined with black; head suborbicular; abdomen acuminate, with pitchy brown, interrupted transverse bands." He states that "the only specimens of this species I have seen are two males, which I took from off a pintado (*Numida meleagris*)." We have not had the opportunity to search for this species and can not say whether any effort has been made in this country to obtain parasites from the guinea fowl. It is most likely that a careful examination of a number of the fowls would furnish examples of this species and possibly still others not yet recognized.

THE PIGEON GONIODES.

(*Goniodes damicornis* Nitzsch.)

According to Giebel this species was first described by Nitzsch, and his reference is "Zeitschrift f. ges. Naturwiss., 1866, XVII 119." It is a rather large species, a little more than two millimetres in length and of a bright-brown color. The head is very much rounded in front and strongly angular behind. It occurs only on pigeons, but upon these appears to be rather common, though not yet met with in our own collecting.

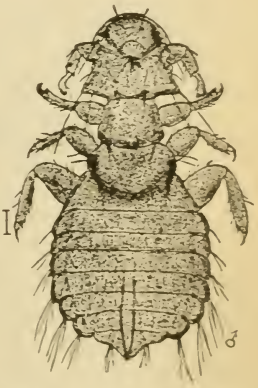

FIG. 23.—*Goniodes damicornis.* (Original.)

THE LITTLE PIGEON GONIODES.

(*Goniodes minor* Piaget.)

Piaget (Les Pediculines, p. 256) has described as a distinct species, under the above name, a form quite similar to the preceding but smaller and presenting some differences of the antennæ and form of the head. According to this author it is found on the domestic pigeons and also on *Columba tigrina*, *C. risoria*, and *C. bitorquata*. It has not to our knowledge been recorded in this country as yet, but is likely to be found along with the other forms.

LOUSE OF TURKEY.

(*Goniodes stylifer* Nitzsch.)

Nitzsch describes this species in Germar's Magazine (III, 294), and it has been frequently mentioned since that time. It was also described by Schrank under the name of *Pediculus meleagris* (Faun. Ins. Aust., 504). It is a large species, 3 millimetres or more in length, and quite readily distinguished from other common species by the hind angles of the head, which are extended backward into long styles from the ends of which extend strong bristles. The thorax is angular with a black margin and the abdomen is pale with transverse bands of dark color.

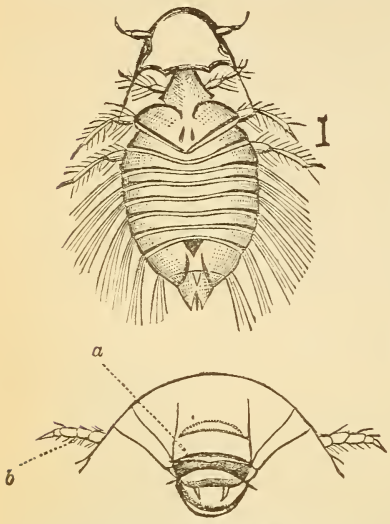

FIG. 24.—*Goniodes stylifer* enlarged: *a*, mouth parts; *b*, antennæ. (From Verrill, after Cuvier.)

The species probably has a distribution equal to that of the turkey itself, and with the other species common to this fowl render it pretty thoroughly infested.

THE PEACOCK GONIODES.

(*Goniodes falcicornis* Nitzsch.)

This large and common species appears to have been first recorded by Redi, who figured it under the name of *Pulex pavonis*. Since that time it has engaged the attention of Linnæus, Frisch, Olfers, Fabricius, Stephens, Schrank, Nitzsch, Burmeister, Stewart, Panzer, Denny, Giebel, Piaget, and numerous other writers, who have described, figured, and discussed it under one name or another, from which we would infer that it must have been one of the most common and frequently met with of any of the parasites of our domesticated fowls.

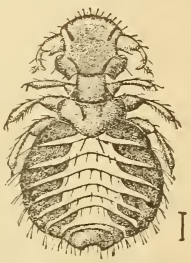

FIG. 25.—*Goniodes falcicornis*. (After Denny.)

It is a large species, 3 to 4 millimetres in length, of a bright reddish yellow color, with a large head the hind angles of which are acute and prominent. The first joint of the antenna in the male is large and bears a prominent tooth. The abdomen is broad, light yellow, with prominent transverse lateral bands extending nearly to the middle line.

THE PHEASANT GONIODES.

(*Goniodes colchicus* Denny.)

This species is not likely to prove of any special interest in this country, and we will simply mention it and repeat the diagnostic description given by Denny:

"Bright chestnut-yellow; head subquadrate, temporal angles obtuse, thorax with a broad ferruginous margin; abdomen pale, yellow-white, nearly orbicular, each segment, excepting the first and last two, with a pitchy black arcuate fascia."

He refers this species to the insect mentioned under the name of *Pediculus phasiani* by Fabricius, with a question as to their identity.

GONIODES GIGAS.

Professor Comstock, in his Introduction to Entomology, page 86, names this as a parasite of the hen, but he states no authority for the species and we are unable to find any other reference to it.

LIPEURUS OF THE CHICKEN AND PHEASANT, ETC.

(*Lipeurus heterographus* Nitzsch.)

This species, first recorded by Nitzsch, would appear from the writings of European naturalists to be rather common, but it has not to our knowledge been taken in this country, a fact which may be due rather to the little attention that has been given to collecting these insects in this country than to their absence.

According to the figures given by Piaget, it differs decidedly from the *variabilis*, with which it is most likely to be confused, in having the head rather narrowed in front instead of inflated, and the body is much stouter.

Besides occurring upon the common domestic fowl, it is said to occur upon pheasants of certain species.

LOUSE OF THE GUINEA FOWL.

(*Lipeurus numidæ*, Denny.)

Denny described this species under the name of *Nirmus numidæ*, but Piaget refers it to the genus *Lipeurus*.

It is characterized by Denny as "livid yellow, shining and smooth; head subpanduriform, lateral margin black; abdomen with two fuscous interrupted dorsal fasciæ."

As he states that he found "two specimens," it would appear not to have occurred in great abundance.

LOUSE OF THE SHELDRAKE.

(*Lipeurus tadornæ* Denny; *Lipeurus lacteus* Giebel.)

Denny described this species from specimens taken from the sheldrake, and cites also a manuscript name of Leach, *Ornithobius tadornæ*, which he assumes to be the same and which applied to specimens in the British Museum. The species was later described by Giebel with the name *lacteus*, though he at the same times quotes Denny's name without stating any reason for the change.

Piaget states that he prefers the name chosen by Giebel to that of *tadornæ* in order to avoid as much as possible the names of birds upon which the parasites have been found. If this principle were carried out it would involve the change of hosts of names applied to members of this group of insects, and as it is directly opposed to the well-established principle of priority we believe the name applied by Denny should be restored.

The insect is characterized by a milky-white color, the surface smooth and shining, the head, thorax, and abdomen with black marginal spots; it is elongate in form and the head heart-shaped.

Professor Comstock cites it as occurring also upon the goose, but upon what authority we are unable to say, as the authorities consulted mention it only as a parasite of the sheldrake.

THE PIGEON LIPEURUS.

(*Lipeurus baculus* Nitzsch.)

This is another of the species that was given a name and figure in the work by Redi more than 200 years ago. It was also described briefly by Linné under the name of *Pediculus columbae*, but since the description by Nitzsch in 1818, under the name of *Lipeurus baculus*, this has been the accepted name, and has been used by nearly all writers since that time.* It is not strange that it attracted the attention of early naturalists, as it occurs in wonderful abundance on almost every pigeon that may be examined, and its striking appearance, due to the extreme slenderness of the body, would at once catch the eye of the observer.

FIG. 26.—*Lipeurus baculus*. (Original.)

It is about 2 millimetres in length, the body very slender; the head and thorax are of a bright reddish-brown color, while the abdomen is rather dusky with a series of patches of a brown color corresponding with the segments of the abdomen.

*Giebel names and describes two species, *bacillus* and *baculus*, referring both to Nitzsch, and placing under *bacillus* the form which all other authors refer to *baculus*, and referring to *baculus* a form not separated by other authors, but which he describes as different from the other form. It seems undesirable to add names without a more decided difference in form, and we agree with Piaget in uniting both under the old name.

So far as known, this species is confined to pigeons, and there seems no danger of their being transmitted to other fowls with which they may associate.

Piaget states that he has found the females astray upon a *Sula alba*, upon a *Totanus glottis* and upon a *Charadrius minor*, only in the last case the appendages of the clypeus wanting; the last segment had the lobes more acute and the dimensions were less.

Denny described, under the names of *Nirmus claviformis*, what appears to be the young of this species, though he gives measurements for males and females, which would seem to indicate that he was able to see the sexual organs. In all the specimens we have examined that agree with his figure and description of this form we have been unable to discover the genital organs, which makes it appear that they are immature, and they are in all cases associated with the *baculus*, with which they seem to agree in all structural characters. The body is shorter, the markings less distinct, and the rudiment of a trabecula is more prominent than in the adults.

It seems best, therefore, at least till well marked males and females can be found, to consider these as immature *baculus*.

Piaget does not discuss this matter, but in his index to the "Les Pediculines" he gives *N. claviformis* as a synonym of *L. baculus*.

THE SQUALID DUCK LOUSE.

(*Lipeurus squalidus* Nitzsch.)

According to Denny, this species was referred to by Fabricius under the name of *Pediculus anatis*, and it seems extremely probable that it was referred to under other names by many of the early writers, since it is so common on many species of ducks that it is hardly possible that it should have been entirely overlooked. The first definite reference to it, however, is the description by Nitzsch in 1818; and, more fortunate than some of the related species, this has been allowed to hold in all subsequent works, and so far as we know there are no synonyms for its specific name.

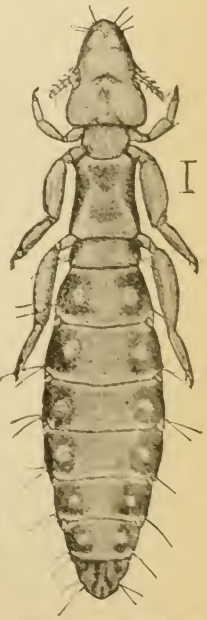

FIG. 27.—*Lipeurus squalidus*. (Original.)

It is a very abundant and common species and occurs on a great many different species of ducks, both wild and domesticated; indeed, so generally does it occur on the different species of the genus *Anas* and related genera that we may almost say that it is common to all species of the family including the ducks.

It is quite characteristic in appearance, and not likely to be confused with other species on the same birds. It is about 4 millimetres (one-sixth inch) in length, elongate in form, and of a light yellowish color, with dark border to the head, thorax, and abdomen.

On the latter this border is broken into a series of quadrate patches corresponding with the segments. The young lack the definite markings of the adults, but have nearly the same general outline of body. The annexed figure will doubtless enable anyone to determine with certainty as to specimens taken from ducks.

(*Lipeurus anseris* Gurlt.)

Under this head is recognized a species which is said to differ from the *anseris* of Linnæus and other authors, which is referred to *jejunis* of Nitzsch. It was described from specimens taken from the domestic goose, but would appear to be rather a rare species since it has not been generally recognized. We insert it upon the authority of Piaget, who seems to consider it as unquestionably distinct from related species, though apparently in doubt as to the real form from which the descriptions were made.

THE LIPEURUS OF THE GOOSE.

(*Lipeurus jejunus* Nitzsch.)

It is generally accepted that Redi had this species in hand as one of the different parasites which he figured, and it has certainly been referred to by Linnæus, Albin, Olfers, and others, but the description by Nitzsch may be taken as the first strictly technical description that would separate it certainly from related forms. Denny records it as taken from the white-fronted goose, the Brent, the wild goose, and the bean goose, and Piaget adds the gray goose, Canada goose, domestic goose, and the *ægypticus*.

It is evident, therefore, that it is generally distributed upon members of the goose family.

We have not had specimens in hand, but it is described as slender, pale yellow-white, with a pitchy margin, the first eight segments of the abdomen with quadrangular bands, and the legs dusky above.

THE TURKEY LOUSE.

(*Lipeurus polytrapezius* Nitzsch.)

This, like the *variabilis*, appears to have been one of the earliest species to receive recognition, as Linnaeus cites Redi (Exper., t. II; fig. 2) with the name *Pediculus accipitris*, while he himself uses the name *Pediculus meleagridis*, and gives a brief description, which probably refers to this species. Authors have quite generally, however, followed the name given by Nitzsch, as above. It has, doubtless, been common wherever this fowl has been kept and is one of the familiar species.

It is of rather large size, 3 to 3½ millimetres (an eighth of an inch) in

length, of an elongated form, having a pale, yellowish white color, and with a black margin around the body. The abdomen is long, and all the segments but the last are marked with a grayish brown trapezoidal spot on each side.

According to Denny, "their mode of progression is rather singular, as well as rapid. They slide as it were sideways extremely quick from one side of the fiber of a feather to the other, and move equally well in a forward or retrograde direction, which, together with their flat polished bodies, renders them extremely difficult to catch or hold. I have observed that where two or more genera infest one bird, they have each their favorite localities; for, while the *Goniodes stylifer* will be found on the breast and neck of the bird, the *Lipeurus polytrapezius* will be congregated in numbers on the webs and shafts of the primary wing feathers."

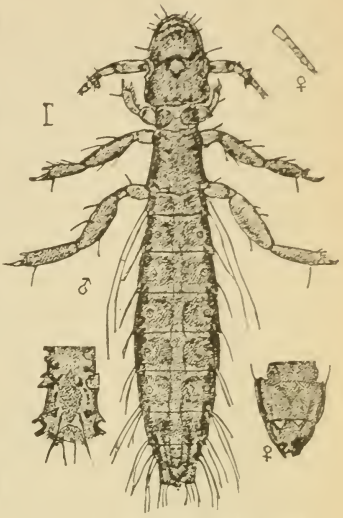

FIG. 28.—*Lipeurus polytrapezius.* (After Piaget.)

THE VARIABLE CHICKEN-LOUSE.

(*Lipeurus variabilis* Nitzsch.)

This species appears to have been recorded as early as 1668 by Redi, later by Frisch, unless these both refer to *Menopon pallidum*, and to have received a brief description by Linnæus (*Fauna Suecica*, No. 1960) under the name of *Pediculus caponis*. The name by which it is now universally known, however, was given with description by Nitzsch in 1818. (Germar's Mag., III, 292.) While no very extensive literature seems to have accumulated in reference to this particular species, it is of course included in the many articles referring to poultry lice in general. It does not seem, however, to be so abundant as some of the other species infesting the common domestic fowl.

FIG. 29. *Lipeurus variabilis.* (After Denny.)

It is about 2 millimetres (one-twelfth of an inch) in length, the body elongated, of a whitish color, and smooth and shining. The margins of the body are black; the head is large, rounded on the anterior margin, and the whole appearance sufficiently distinct from any of the species infesting the chicken, so that, with the aid of the figure, there can be no difficulty in distinguishing it at a glance. Denny says: "Common on the domestic fowl, preferring the primary and secondary feathers of the wings, among the webs of which they move with great celerity."

THE WHITE SWAN LOUSE.

(*Ornithobius cygni* Denny; *Ornithobius bucephalus* Giebel.)

This large and handsome species was quite certainly recognized by Redi and figured by him and has received frequent mention since. It is a conspicuous species and appears to occur in great abundance on different species of swans, so that it is readily obtained. It has been recorded as occurring on the domestic and wild swan of the old world as well as the *musicus* and *Bewickii*, and we have taken it in great abundance from the common swan of this country, probably the Trumpeter Swan.

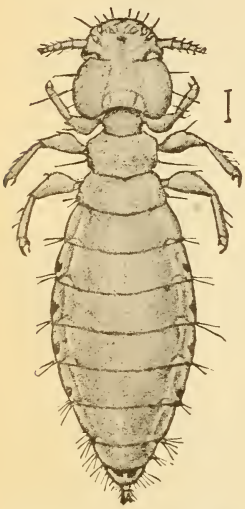

FIG. 30.—*Ornithobius cygni.* (Original.)

The body in this species is whitish, but so transparent that all the internal organs are easily seen through the body walls. There are black points at the outer hind margins of about four of the abdominal segments, as shown in the figure, and the last segment is dusky or nearly black. It is 4 millimetres long (one-sixth of an inch) and the body rather slender and decidedly flattened. Altogether this species seems to be almost as beautiful and as graceful in its movements as the bird which harbors it. Some of the specimens we have secured appear to contain blood, and while these parasites are not supposed to extract blood from their hosts it is possible that they may at times burrow deep enough to secure access to the capillaries or feed upon blood that may have exuded from wounds upon the surface of the body of the bird.

THE LOUSE OF THE CAT.

(*Trichodectes subrostratus* Nitzsch.)

While it is possible that this parasite was referred to by Otto Fabricius about the year 1780 under the name of *Pediculus canis*, the first certain reference to it appears to have been the description by Nitzsch in 1818. Since that time it has been referred to by nearly all writers on the common parasites of animals, but so far as we know there has been no special description of the different stages, and we must assume that there is no important departure from the habits of species that are more thoroughly known.

FIG. 31.—*Trichodectes subrostratus.* (Original.)

It is a little more than a millimetre in length and has much the appearance of the species occurring on other domestic animals, but is distinguished particularly by the form of the head, which is quite pointed, and the under part of the

front of the head is hollowed out in a furrow about the size of a hair. The insect will often be found adhering by the mouth parts with a hair so closely held in this groove that it is somewhat difficult to tell where the hair begins as separate from the insect.

There is no record that we have seen that indicates its presence on any other animal than the domestic cat, and, judging by our own observation, it is only occasionally that cats become infested with it. When they do the usual remedies may be administered, especially a washing with kerosene emulsion, after which the animal should be allowed to dry in a warm place, as the fur is so fine that they dry slowly.

THE BITING LOUSE OF THE DOG.

(*Trichodectes latus* Nitzsch.)

Something over a century ago DeGeer mentioned a species of parasite on the dog under the name of *Ricinus canis*, which probably referred to this species, and another mention by Olfers under the name of *Pediculus setosus* probably preceded the description by Nitzsch under the name which the insect has borne since 1818.

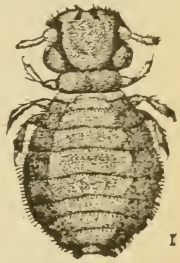

FIG. 32.—*Trichodectes latus*. (After Denny.)

Probably every one who has had much to do with dogs is aware to what an extent this parasite may multiply and how troublesome it is to this friend of man. It is generally believed that the lice are more troublesome to puppies than to old dogs, and it is not at all unlikely that the insects migrate when possible from older to younger animals.

In color this species agrees pretty closely with the other species and it is of about the same length as the cat louse, a little more than 1 millimetre, but it is much broader in proportion, being more than half as wide as long, and the head is short and the front but slightly curved.

THE LOUSE OF THE BEAR.

(*Trichodectes pinguis* Nitzsch.)

Inasmuch as the common brown bear has been to a considerable extent domesticated, and indeed furnishes a means of support to a certain class of people, it seems proper to introduce mention of its common parasite here. The species was described by Nitzsch, and apparently later authors have done little more than quote his description. To what an extent bruin suffers from the company of his guests we are not aware, but they probably multiply upon him as on other animals and cause him the same amount of annoyance.

It is described as characterized by the form of the head, which is subquadrangular. It is nearly 2 millimetres in length.

THE LOUSE OF THE LLAMA.

(*Trichodectes breviceps* Rudow.)

In some parts of South America the llama is a very important domestic animal, and consequently this parasite has a place with the other species included in this work.

This species was described by Rudow in 1866, but as we have not seen specimens we must leave it with the mere mention. It is said to be one millimetre in length and doubtless agrees closely with the other species of the genus in appearance.

THE LOUSE OF THE GOAT.

(*Trichodectes climax* Nitzsch.)

Since this species was described by Nitzsch in the early part of the present century, it does not seem to have received very frequent notice and Denny does not appear to have found it in England. We have as yet not found it in this country, and though it doubtless occurs occasionally among the goats kept here would seem to be rather rare.

It is described as having the head wider than long, quadrangular in shape, and the body in the female nearly two-thirds as wide as long, the length being about 1½ millimetres.

The *Trichodectes caprœ* of Gurlt is considered by Piaget as identical with *climax*, while the *Tr. caprœ* of Packard is not mentioned by him, but Professor Verrill has expressed the opinion that it is equivalent to *limbatus*, mention of which follows. It may be stated here, however, that the figure given by Packard agrees well with Piaget's figure of *climax*. It may be that all of these are but varieties of one species.

(*Trichodectes limbatus* Gervais.)

This species is referred to the Angora Goat, and is recognized as a distinct species by Giebel, Piaget, and others. It is the species to which Professor Verrill thinks Dr. Packard's *caprœ* belongs. Dr. Packard does not state upon which species of goat he found his specimens, but it is probable that they were from the common species, and if so, and inasmuch as his figure agrees fairly well with *climax*, it would seem as likely to belong there.

In a recent bulletin from the Bureau of Animal Industry, Dr. Cooper Curtice describes these forms and endeavors to establish their specific identity. The principal points urged are a proportional difference in size between males and females, a difference in markings, and difference in size of eggs, but these are all variable and the differences, as shown in the excellent figures accompanying the report, are so slight that we are the more impressed with the view that they are the same, and unless it be shown that they do not interbreed nor survive if changed from one host to the other we should be inclined to use the two names as synonyms.

THE LOUSE OF THE SHEEP.

(*Trichodectes sphærocephalus* Nitzsch.)

Redi is credited with the recognition of this species, and following him Linnæus described it under the name of *Pediculus ovis*, and later still it was described in detail under the name given above. Denny's reference to it would indicate it as rare in England and we have not met it here. If it is of rare occurrence it may be considered as fortunate, for, if abundant, it would be rather difficult to contend with on account of the long wool of the host.

The name indicates its characteristic feature, namely, the rounded head. The color agrees closely with the related species.

Where it occurs it would be the best plan to pay close attention to destroying them at the time of clipping the sheep even if they are but few in number, as at any other time the labor of making thorough applications for them is greatly increased.

FIG. 33.—*Trichodectes sphærocephalus.* (After Denny.)

THE BITING LICE OF HORSES, MULES, ASSES, ETC.

(*Trichodectes equi* of Authors.)

The original reference by Linnæus to the lice of horses and asses under the name of *Pediculus equi* most certainly refers to the common *Trichodectes* infesting these animals, but Piaget has reached the conclusion that this reference is to the form subsequently described by Giebel as *Trichodectes pilosus*, and that the form described by Denny as *equi*, and which has since almost universally been treated as the Linnæan species, was in reality a different insect from that described by Linnæus under the same name. He therefore describes this form under the name of *parumpilosus*. It is certainly somewhat confusing to be obliged to drop the familiar designation for so common a species, and were it not that this conclusion has been reached by one who is probably the highest living authority regarding these insects we should hesitate to introduce the change. The figures given by Piaget, however, leave no question that there is a decided difference between *pilosus* and *parumpilosus*, and it is equally certain that our common species belongs to the latter form; so, if there is no question as to Linnæus having the form *pilosus* in hand, we certainly have no right on technical grounds to apply the term *equi* to our common form. We will therefore introduce descriptions and comparisons of the two forms and adopt, for the present at least, and on the authority of Piaget, the names given in his "Les Pediculines."

(*Trichodectes pilosus* Giebel.)

This, according to Piaget, is the form originally designated by Linnæus as *equi*, and which, if that is correct, was the basis for a name

which has been widely used to designate the biting lice of the members of the horse family. The original reference dates back considerably more than a century, and doubtless the insect was familiar many centuries before that, as the horse and ass have been too familiar as domestic animals to allow of the parasites common to them escaping entirely the notice of man.

According to Piaget this occurs upon both the ass and the horse, while the following species he has found only on the horse.

We have not been fortunate enough to secure examples of this form, though we have the other in great abundance, so we are compelled in describing to depend upon the excellent description and figures of Piaget, the latter being reproduced here for comparison. The head in this form is shorter and less rounded in front, that of the male being still less rounded than the female, while the abdomen is more slender and tapering. The transverse bands are also represented as less conspicuous. Perhaps the most striking point, however, is the position of the antennæ, which stand well forward on the head, so that the front border of the head and base of the antennæ are nearly in line.

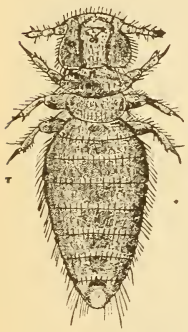

FIG. 34.—*Trichodectes pilosus.* (After Piaget.)

The habits of the species and the remedies applicable to it are naturally identical with those of the other related species.

(*Trichodectes parumpilosus* Piaget.)

While it does not seem possible that all the writers previous to Denny should have overlooked this form, which appears to be the more common one, at least on the horse, it may be true that Denny was the first to give it a thorough description and careful drawing. He speaks of it as common on the horse and ass, but Piaget says he has never found it on the ass and there is of course a possibility that Denny did not distinguish between this and the preceding species.

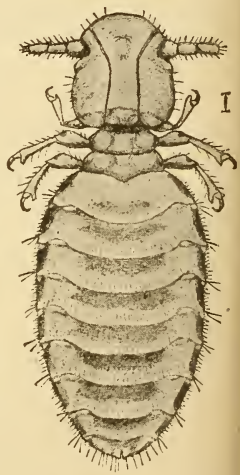

FIG. 35.—*Trichodectes parumpilosus.* (Original.)

In this species the head is decidedly rounded in front, the antennæ inserted well back, so that the head forms a full semicircle in front of the base of the antennæ. The abdomen is more slender and tapering than in *scalaris*, but less so than in *pilosus*, as shown in Piaget's figures. The color is much the same as in the allied species, the head, thorax, and legs being a bright reddish brown or chestnut and the abdomen of a dusky yellowish color, with about eight transverse dusky bands occupying the central or anterior portions of the segments and extending from the middle line a little more than half way to the mar-

gin. They are hardly as conspicuous as in *scalaris* and apparently rather longer and more conspicuous than in *pilosus*.*

Piaget describes two varieties of this species, one from the Burchell's Zebra (*Equus burchelli*) which he calls var. *ocellata* on account of a series of eye-like uncolored spots on the abdomen, and the other from the small horses of Java, var. *tarsata*, which has the second joint of the tarsi particularly developed and which he mentions as in some respects approaching *pilosus*.

The habits of this species are well known and have received mention for many years. They seem to accumulate more particularly upon colts or horses in pasture, but their presence becomes most manifest in the latter part of the winter, when they may become so numerous as to cause great irritation to the animals infested. They occupy more particularly the region of the neck, and also accumulate around the base of the tail and between the legs, and the animals will frequently rub bare places in these regions in their attempts to rid themselves from the irritation.

It is unnecessary to give any special notice regarding treatment, as they must be attacked on the same plan as other species.

Even if it proves that this species does not ordinarily infest the mule or donkey it would be policy not to allow these animals, if infested, to associate with horses, as we have no assurance as yet that they can not thrive on any of the members of the equine family.

BITING LICE OF CATTLE.

(*Trichodectes scalaris* Nitzsch.)

This species, which is a very abundant one upon cattle and occurs the world over, appears to have been first technically described by Linnæus (System. Naturæ, VII, p. 1017, No. 9,) under the name of *Pediculus bovis*, and evidently the same species is referred to under the name of *Pediculus tauri* (*Fauna Suecica*, 1946). Notwithstanding these descriptions, both of which were under a different genus from that in which it is now placed, the species was again described by Nitzsch (Germar's Magazine, III, 296) under the name of *Trichodectes scalaris*, and it has been known by this name in all of the numerous writings subsequent to this description. It has been treated by all writers upon the parasites of animals and is one of the best known species of parasitic insects. The effects upon the cattle infested are often quite serious on account of their great number, but they are apparently less injurious than the suctorial species which infest cattle. This injury depends, of course, upon

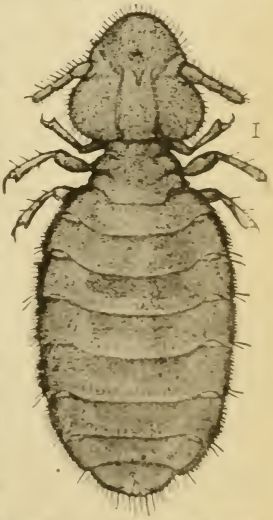

FIG. 36. — *Trichodectes scalaris*. (Original.)

* The hair line in the figure is about one-fifth longer than it should be.

the numbers occurring upon the individual, and somewhat upon the irritability of the animal infested. This species much resembles the form occuring upon horses, but is somewhat shorter, and the abdomen tapers less towards the extremity; the dark bands across the abdomen are also more distinct. They are generally found in greatest abundance in the spring of the year, at which time adults and eggs are discovered in great numbers. Their development corresponds with the other species, and they are subject to the same methods of attack.

They are very distinct from the suctorial species in appearance, and this difference is recognized by practical men, who speak of them as the "little red lice," as contrasted with the "blue lice," and they recognize too the difference in the trouble caused by the two species.

The application of kerosene emulsion or of tobacco decoction at seasons when this is practicable is effective, and we have found the process of fumigation described in the chapter on remedies to be effective, and this of course is applicable at all seasons of the year, even in cold weather, without danger to the animal.

FAMILY LIOTHEIDÆ.

LOUSE OF THE DOVE.

(*Menopon giganteum* Denny.)

This species of louse infesting doves is described by Denny (Anop. Brit., 225, f. 2, pl. 21). It does not appear to have been commonly observed since that time. A species is described under the name of *Menopon latum* (Piaget, Les Pedic., 457), which is probably the same as *Menopon giganteum*. As the species is evidently not a very abundant one, and the habits and remedies for this species are very similar to those for the *Menodon pallidum*, it is not necessary to enter into detail as to treatment. According to Denny, it is of a yellowish brown color, shining, the head with a small brown patch on each side, the prothorax with a cruciform depression and the lateral margin reflected.

THE COMMON HEN-LOUSE.

(*Menopon pallidum* Nitzsch.)

This species, probably the most abundant of all the lice infesting poultry, has been a familiar creature in the writings of entomologists and also in all the literature of poultry raising.

It was evidently recognized by Redi (Exper., tab. 16, Fig. 1), who figured it under the name of *Pulex capi*. Linnæus described it as *Pediculus gallinæ* (Syst. Nat., 1020, 32), and it is also mentioned by Panzer under the same name. Olfers described it under the name of *Nirmus trigonocephalus*, and Nitzsch, recognizing its true generic relations, gave it the name of *Menopon pallidum*. While Denny, Giebel, and Piaget

all agree in referring the figure by Redi to this species, Linnæus places it under his *Pediculus caponis*, which is equivalent to *Lipeurus variabilis* N.

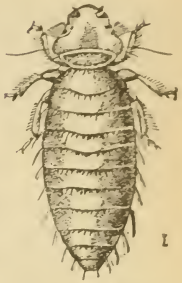

FIG. 37.—*Menopon pallidum.* (After Denny).

The annoyance that this one species causes poultry is probably equal to that of all the other species combined, for it occurs in great abundance and almost every fowl examined will be found infested. Then, too, it passes readily to other species of birds, and many instances are recorded where horses kept near henroosts have been very seriously troubled by them. Some of these accounts seem hardly credible taken in connection with the habits of the insect, and we are inclined to think that the worst cases, at least, may have been due to the presence of itch mites on the poultry and the migration of them to the horses, though in such case we should expect the fowls themselves to show more serious injury. It is, at any rate, important to keep lousy chickens away from horses.

The louse is pretty easily distinguished from other common species infesting the hen by its light color and its great activity, running with great celerity among the feathers and from them upon the hands of persons holding fowls. It is from 1 to 1½ millietres in length, rather slender, and of a light straw-yellow color.

Remedies for this species must aim to reach the hiding places of the lice on the roosts and in the cracks of the walls of the henhouse as well as to destroy those on the fowl. Thorough fumigation and whitewashing, with careful attention to cleanliness, will do much to keep them in check. Pyrethrum, kerosene, etc., may be used direct upon the fowls, and if they are liberally supplied with ashes and road dust they will do much to protect themselves.

(*Menopon biseriatum* Piaget; *Menopon stramineum* Nitzsch.)

Under the above name Piaget describes a species of louse taken from the *Gallophasis cuvieri*, and which he speaks of as occurring also on the domestic fowl, the pheasant, and other birds. He says "Sur un *Gallophasis* (*Euplocamus*) *cuvieri* j'ai retrouvé le même parasite sur un *Gallus domesticus*, sur un *Phasianus colchicus*, sur un *Pavo spiciferus* male et femelle en assez grand nombre et dernièrement aussi sur une *Meleagris galloparo*. Il se rapproche évidemment du *stramineum* de N., promenant d'une *Meleagris galloparo*, dommage que la diagnose de Giebel (Epiz., p. 291) soit trop vague pour l'identifier, mais plus encore du *Pediculus Meleagridis* de Panzer (51 f. 20). Peut-être est-ce le parasite de Schrank No. 1019, recueilli sur le même oiseau."

It seems very probable that the description of Panzer, Nitzsch, Giebel, and Piaget all apply to the same insect, and if such is the case it would

carry the recognition of the species back to 1793 when it was described by Panzer under the name of *Pediculus meleagridis*.

It would seem to be confined more particularly to the Phasianidæ, and of these to infest particularly the peafowls and turkey, its occurrence on the hen being only occasional. It would evidently pass readily from any of these birds to others in the same family.

THE PHEASANT MENOPON.

(*Menopon fulvo-maculatum* Denny; *Menopon productum* Piag.)

Denny, in his Monograph published in 1842, describes and figures, under the name of *Menopon fulvo-maculatum*, a species of louse occurring on the quail and pheasant. Piaget describes also a species occurring on pheasants (*Phasianus pictus* and *P. colchicus*), which he considers as probably the same as Denny's, though neither the description nor the figure enable him to determine certainly.

According to Denny, "It is fulvous yellow and pubescent; head semilunar, with a pitchy transverse spot on each side; abdomen clavate, with pale spots on the lateral margin."

Piaget says it is very similar to *M. pallidum*, though distinct, and calls the color "jaune ocre, fauve sur les cotés de l'abdomen."

Piaget also describes a variety (*major*) taken from the *Lophopharus resplendens*.

THE PEACOCK LOUSE.

(*Menopon phœstomum* Nitzsch.)

This species is apparently confined to the peafowls, as since its description in 1818 it has been taken only from these birds. Piaget states that it occurs on three different species, *Pavo spiciferus*, *P. cristatus*, and *P. javanicus*. It has not been recorded from this country, but is likely to be found by searching these birds.

LOUSE OF THE GUINEA HEN.

(*Menopon numidæ* G.)

Giebel seems to have been the first to have mentioned this species and we may infer that it is usually not abundant. Piaget speaks of it as similar to the *Menopon phœstomum* N.

We have not had opportunity to make careful search for it, but it doubtless occurs on guinea fowls in this country. It would probably be difficult for an ordinary observer to distinguish between this and the common species infesting hens, and even if noticed in abundance on guinea fowls it would very likely escape mention.

LOUSE OF DUCKS.

(*Trinoton luridum* Nitzsch.)

Redi seems to have been the first to give mention of this very common species, it being figured in the Exper., Pl. XII, as the louse of the Teal. It is also figured by Albin (Pl. 46) under the same common name as quoted by Denny. Nitzsch described it in 1818 under the name given above, and the species has been fortunate enough not to have received any other designation since, although it hasbeen mentioned in most of the works referring to the parasites of domestic fowls or the parasites of birds. It is a very common species and occurs on a great many different species of ducks, so that it is unnecessary to try and enumerate the hosts. So far as we have seen or can learn from record, however, it is not known to occur on birds outside of the duck family (*Anatidæ*).

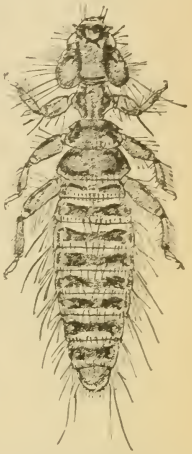

FIG. 38.—*Trinoton luridum*. (Original.)

Its nearest ally is the goose louse, to be mentioned next, and it is easily distinguished from that by the difference in size and the more distinct markings in this species. The markings are shown in the accompanying figure, their distribution on the head, thorax, and abdomen being clearly indicated; the abdomen is a trifle narrower and the sides a little more parallel than in some specimens observed. It is 4 to 5 millimetres in length.

LOUSE OF THE GOOSE AND SWAN.

(*Trinoton conspurcatum* Nitzsch.)

This species was evidently recognized at an early date, and is said to be mentioned by Sulzer under the name of *Pediculus anseris*. Nitzsch described it in 1818 under the name which has been universally adopted since, and it has received frequent mention since that time. It is very similar to the *Trinoton luridum*, but may generally be easily separated by the more diffuse coloring and its larger size, being 6 millimetres (3 lines according to Denny) in length. The two species are not known to infest the same kinds of birds. This species occurs on a number of species of geese and swans, and on one gull; according to Denny on the common domestic goose, on the *Larus canus*, and *Cygnus bewickii;* on *Cygnus olor*, according to Burmeister; on *C. musicus* and *olor*, according to Piaget; and on *Anser ruficollis*, according to Grube.

While the *Trinoton luridum* we have found to be rather common in America, the *conspurcatum* has not been met with, but the opportunities for examining geese have been limited.

LOUSE OF THE GOOSE.

(*Trinoton lituratum* Nitzsch.)

This quite distinct species of louse has been known to entomologists since 1818, when it was described by Nitzsch. Denny, however, did not recognize the application of the description to this form and redescribed it under the name of *Trinoton squalidum*. Later writers, however, have adopted the earlier name and there will probably be no further confusion regarding it.

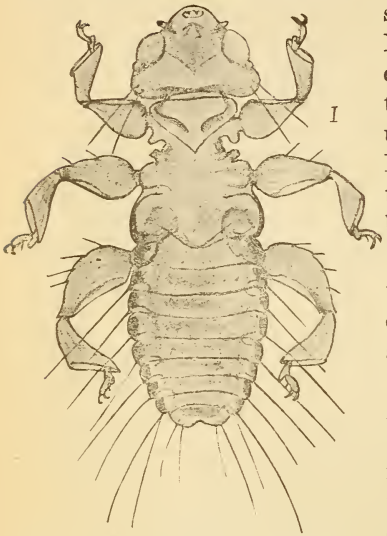

FIG. 39.—*Trinoton lituratum*. (Original.)

It is quite easily distinguished from the other species of Trinoton, being considerably shorter, smaller, and of a nearly white color.

It occurs, according to Denny, on *Anser albifrons*, the domestic goose, and on *Anas clypeata*. It is also referred to the Smew, and Piaget states that it is has been taken from *Dendrocygna arborea* and *Anser albifrons*.

THE PIGEON LOUSE.

(*Colpocephalum longicaudum* Nitzsch.)

Nitzsch described this form, which occurs on pigeons, in 1818, but it was again described by Denny in 1842, who gave it the name of *turbinatum*. Giebel retained both these names, evidently considering that they referred to distinct species, but Piaget has placed them together.

The species would not seem to be so abundant as some of the other species of Pigeon lice, and it has not been found as yet on pigeons that we have had an opportunity to examine.

It does not appear to have been found on any other birds, but has been taken from the common domestic pigeon and also the Turbot.

THE SWAN LOUSE.

(*Colpocephalum minutum* Rudow.)

Rudow seems to have been the first to recognize this species, though its occurrence upon the swan (*Cygnus musicus*) makes it rather strange that it should have escaped observation so long. It is a very small, species, as would be inferred from the name, and this may account in part for its not having been earlier noticed.

It has not been recorded from this country, but may be looked for upon our species of swans, as the lice infesting these birds are generally widely distributed.

LOUSE OF THE GUINEA PIG.

(*Gyropus gracilis* Nitzsch.)

The Guinea pig is perhaps a rather unimportant factor among the domesticated animals, but it supports its due quota of parasites, nevertheless, and they require a brief mention at least. They are quite interesting in structure, differing largely from any of the species considered hitherto.

The one to first receive notice, and probably the one here given, was referred to by Schrank under the name of *Pediculus porcelli*, but Nitzsch, in 1818, described it as *Gyropus gracilis*, a name which has been used by all subsequent writers.

It is referred to generally by writers on the subject and would seem to be a fairly common species where guinea pigs are kept. It has not been met with in this country so far as records show, but may be looked for with great probability of success in any place where guinea pigs are kept in numbers.

Denny characterizes it as "elongate, pale, fulvous-yellow, finely pubescent; head and thorax darker, segments of the abdomen with transverse striated fascia at the sutures; tarsi and ungues very short and minute."

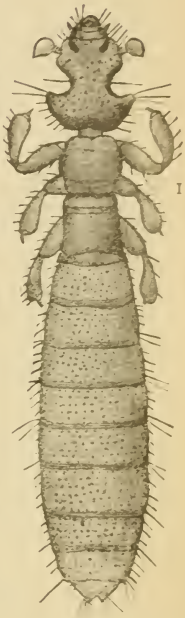

FIG. 40.—*Gyropus gracilis*. (After Denny.)

(*Gyropus ovalis* Nitzsch.)

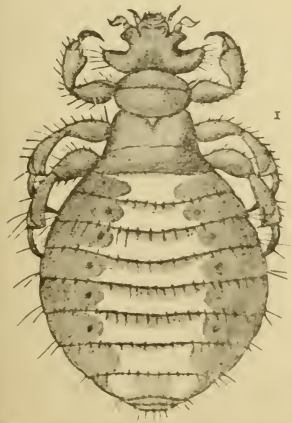

FIG.—41. *Gyropus ovalis*. (After Denny.)

This is a form closely related to the preceding species, and observed and described by Nitzsch at the same time. It differs from that species in the much shorter and broader body, and is, according to Denny, "pale yellow-white; head and thorax bright ferruginous, the former transverse; temporal lobes produced; abdomen large, nearly orbicular; legs thick, the two posterior pairs curved; ungues long, curved, and strong."

The scanty hair of the guinea pig makes the application of washes for the destruction of the lice a very simple matter, so that wherever it is a matter of importance there need be no difficulty in ridding the animals of the parasites.

LOUSE OF THE POCKET GOPHER.

(*Trichodectes geomydis*, n. sp.)

Related to the Trichodectes infesting the larger mammals is a species which has been taken in immense numbers from the Pocket Gopher (*Geomys bursarius*), at Ames, Iowa. It was first taken in 1883 and since then has been collected from a great number of individuals, and I have also seen specimens taken from the western gopher, *Thomomys*, in a collection of parasites kindly loaned me by Mr. S. E. Cassino.

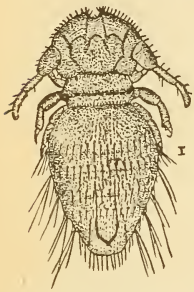

FIG. 42.—*Trichodectes geomydis*. (Original.)

Body robust and rather hairy. Antennæ very long, the basal segment enlarged, the head with a deep semicircular incision in front.

The head is rather wider than long and the antennæ are situated somewhat posterior to the middle and usually directed backward, very large and long, the joints nearly equal in length, but the basal are much enlarged in the male. Head with a deep semicircular incision on the otherwise semicircular anterior border, the posterior border slightly trilobed. Thorax short and broad; suture distinct; abdomen ovate, tapering regularly and rapidly to the anal segment. Genital apparatus of male distinct. The hairs are distributed evenly over border of head and sides of body; four central segments of abdomen with transverse rows of stronger hairs or weak spines, and the lateral posterior angles of all segments but the first with long bristles. Length, 1 millimetre.

The antennæ in male and the deep frontal incision separate this from any species known to me, and I think there is no question as to its being a distinct species.

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